

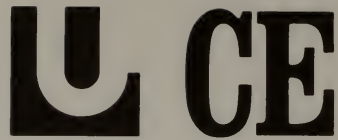
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**UNIVERSITY
OF LOWELL
CONTINUING
EDUCATION**

Bulletin of Undergraduate Studies



UNIVERSITY OF LOWELL

Continuing Education

Evening Calendar

**OFFICE: Lower Level, Cumnock Hall
North Campus**

First Semester (Sept. 1986)

August 25, 26, 27, 28; 6:30-8:00 p.m. Registration
Monday through Thursday
September 2, Tuesday Classes begin
October 13, Monday Columbus Day Holiday
October 24, Friday Withdrawal Deadline (W Notation)
November 11, Tuesday Veteran's Day
November 27, Thursday Thanksgiving Recess
December 16, Tuesday End of First Semester

Second Semester (Jan. 1987)

January 5, 6, 7, 8; 6:30-8:00 p.m. Registration
Monday through Thursday
January 12, Monday Classes begin
January 19, Monday Martin Luther King, Jr. Birthday
February 18, Monday Washington's Birthday
March 6, Friday Withdrawal Deadline (W Notation)
April 20, Monday Patriots' Day Holiday
April 27, Monday End of Second Semester

SUMMER SESSION (May 1987)

Dates will be available in the Summer Evening Bulletin (April 1987)

Bulletin of Undergraduate Studies

Published by the University of Lowell, 1 University Avenue, Lowell, Massachusetts 01854.

Each undergraduate is expected to be familiar with the contents of this publication.

Policy statements and fee schedules as published in this **Bulletin of Undergraduate Studies** reflect information which was current at the end of the academic year 1985-1986. Such statements and schedules are not intended to be and should not be relied upon as statements of University contractual undertakings. Although the University provides notice concerning changes of policy and fee schedules as is reasonably practicable under the circumstances, it reserves the right in its sole judgment to implement new rules and regulations and to make changes of any nature in its program, calendar, procedures and standards, degree requirements, and academic schedule (including, without limitation, changes in course content and class schedules.) The information presented in this bulletin has been extracted from the general catalogue of the University of Lowell. The information listed therein also includes policies which govern day programs of the University. The Office of Continuing Education periodically releases special announcements from departments, colleges, and the University and, when feasible, directs instructors to read or distribute these in classes.

Administrative policies of a system-wide nature (e.g., admissions policies, tuition, and fees) are subject to change by the Board of Trustees of the University of Lowell and the Massachusetts Board of Regents of Higher Education without advanced notice. The University of Lowell exerts reasonable efforts to provide comparable or substantially equivalent instructional services and facilities when in its judgment it is necessary to do so. However, it assumes no liability for failure to deliver or for delay in delivering such services when the causes

for such failure or delay are beyond the reasonable control of the University, which causes include, without limitation, the following: power failure, fire, accident, natural disaster, work slowdown and strikes, loss of personnel, changes in funding, and acts of public authorities. Listings of course offerings are subject to change by concerned departments and University administrators in the event that unforeseen faculty changes have taken place or insufficient numbers of students have subscribed to course offerings. The official schedule of course offerings for each semester is provided in the Schedule of Classes, which is published biannually by the Evening School.

The University of Lowell is an Equal Opportunity/Affirmative Action University and does not discriminate in employment or access to programs or services on the basis of race, sex, color, national origin, religion, handicap or veteran's status, and is in compliance with Title IX of the Education Amendments of 1972 and Section 504 of the Rehabilitation Act of 1973. Any inquiries and/or grievances may be referred to the Affirmative Action Officer, the Title IX Coordinator, the Handicapped Coordinator and/or to the Director, Office of Civil Rights, U.S. Department of Health, Education and Welfare, Washington, D.C.

In registering for courses, each student assumes full responsibility for knowledge of and compliance with the definition, regulations, and procedures for the University as set forth in this bulletin.

Moreover, in accepting admission to the University, each student assumes responsibility for knowledge of and compliance with the definitions, regulations, and procedures of the University pertaining to his or her student status as set forth in the appropriate University of Lowell publications and bulletins.



Table of Contents

Academic Calendar	Inside Cover
General Information	3
Student Services	5
Directions to the University	7
Campus Map	7
General Policies	8
Registration Information	10
Tuition and Fees	12
Admission and Degree Program Matriculation Information	13
University Requirements for Associate Studies	13
University Requirements for Baccalaureate Studies	14
Grading Information	17
Course Equivalency Procedures	23
College Offerings	
College of Engineering	
Degree Programs	24
Course Offerings	36
College of Health Professions	
Degree Programs	51
Course Offerings	54
College of Liberal Arts	
Degree Programs	56
Course Offerings	60
College of Management Science	
Degree Programs	72
Course Offerings	76
College of Pure & Applied Science	
Degree Programs	81
Course Offerings	89
Continuing Education Administration	99
Senior Lecturers	100

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General Information

History and Aims

The University of Lowell welcomes your interest as a prospective student. While a new school by virtue of 1973 Massachusetts legislation, the University of Lowell is actually a merger of two long-established educational institutions — Lowell State College and Lowell Technological Institute. These two components of the University represent a 161 year contribution to higher education dating back to the 1890's. Administration, faculty and resources of the two co-educational schools are now combined in the University of Lowell, an institution comprising seven colleges, a graduate school and continuing education facilities.

The aim of Continuing Education (which includes the Evening School of the University of Lowell) is to provide sound educational programs at both the graduate and undergraduate levels so that a student's years will be characterized by the growth of a mature and discerning mind, and the attainment of professional competence in a chosen field of concentration. Above all, Continuing Education seeks to prepare its students to be effective participants in the community at large and thus encourages the development of an awareness of the relations between the intellectual and the technical skills mastered in the classroom and the society in which we live. It is hoped that students will develop a spirit of free inquiry and a dedication to the service of society during their years at Lowell.

Facilities of the University

The 100 acre University of Lowell campus is divided into North and South campuses by the historic Pawtucket Falls of the Merrimack River. The buildings — most of which have been erected in the last 15 years — represent an investment of 100 million dollars.

Continuing Education

Continuing Education oversees all the education at the University other than full-time graduate and undergraduate programs. In operation day and night, twelve months of the year, Continuing Education offers both credit programs leading to a degree and non-credit courses, scheduled at times convenient for those in the community who seek to accommodate study at the University to their professional and domestic commitments. In addition to its full range of credit and non-credit offerings, Continuing Education's flexibility enables it to respond with a continually updated series of workshops and seminars to the professional advancement requirements of individuals and the immediate educative needs of industry.

Evening Division

The Evening Division operates the Evening School components of Continuing Education, which offers a broad spectrum of courses to satisfy the educational needs of people who are restricted to evening attendance. Many evening students are transfer students from community colleges and other post-secondary institutions and veterans. The Evening School is particularly sensitive to the needs of people who seek vocational and professional career development. Programs are tailored so that the sequence of academic work will coincide with, and contribute to, systematic job progress over a period of years. Undergraduate credit courses and degree programs are under the academic jurisdiction of University colleges. Graduate credit courses and degree programs are under the academic jurisdiction of University colleges the administrative control of the Graduate School.

Accreditation and Professional Memberships

The University of Lowell is an accredited member of the New England Association of Schools and Colleges. Professional programs at the baccalaureate level also are accredited by the following national associations:

- Accreditation Board for Engineering & Technology
- American Physical Therapy Association
- National Accrediting Agency for Clinical Laboratory Sciences
- National Association for Industrial Technology
- National Association of Schools of Music
- National Council for the Accreditation of Teacher Education
- National League for Nursing

Additionally, specific programs have been reviewed by the following associations to insure compliance with applicable professional standards:

- American Chemical Society
- National Association of State Directors of Teacher Education & Certification

The following programs offered through Continuing Education are accredited by the Technology Accreditation Commission of the Accreditation Board for Engineering and Technology:

- Civil Engineering Technology
- Electronic Engineering Technology
- Mechanical Engineering Technology

Accreditation indicates that the University is recognized and approved by regional and national associations concerned with the quality of higher

education and it assures that study undertaken here has transfer value to other accredited institutions of higher education. The University is also a member of the following associations:

American Association of Colleges for Teacher Education

American Association of Colleges of Nursing

American Council on Education

Assembly of Collegiate Schools of Business

Association for State Colleges and Universities

College Entrance Examination Board

Council of Colleges of Arts and Sciences

National Association of Summer Sessions

National University Continuing Education Association

New England Board of Higher Education

Student Services

Library

The University libraries, which consist of the Alumni-Lydon Library (North Campus) and the O'Leary Library (South Campus), have a seating capacity of 2,000. Present library holdings include over 305,740 books and periodicals and a large number of such non-print materials as audio recordings, video tapes, films, and microforms. The O'Leary Library has holdings in the humanities, fine arts, education, and music, and houses the Educational Resources Information Center microfiche collection, 118 listening stations, and a collection of music scores. The Alumni-Lydon Library is rich in resources for science and business management fields. Special resources of the University libraries include rare books and artifacts. The University libraries provide interlibrary loan services and also function as a U.S. Government depository.

Library Regulations

New students should have their pictures taken for an identification card at the beginning of the academic year. This photo-identification card must be presented upon request for admission to the library facilities and whenever a student wishes to take materials from a library. A student's library privileges, including the right to study in library areas, may be revoked when library rules concerning appropriate conduct have been violated.

Students who retain regular circulating materials for three or more weeks beyond their authorized period of circulation, or who retain library materials after the beginning of the final examination period without explicit permission from the library staff shall forfeit their library privileges. Students who steal or maliciously deface library property forfeit their library privileges indefinitely. Reinstatement of library privileges may be granted only by the Library Director. Students who incur library fines, lose library materials, or damage library property must discharge their financial obligations to the University Library before the end of the semester in which such obligations have been incurred. Administrative dismissal from the University may be invoked when a student fails to comply, after due notice, with a direction to discharge library fines and obligations. Seniors who have not discharged their financial indebtedness to the University Library by the end of May will not be permitted to graduate until such time as they have discharged their indebtedness and their records have been cleared by the Business Office.

Library Fines

Library fines are levied according to the following schedule:

1. Overdue books and phonograph records:
 - a. Regular circulating books and phonograph records — \$.10 a day per book or record;
 - b. Reserve material — \$.25 per 1/2 hour to a maximum of \$2.00 per book or record for the first day and \$5.00 per book or record for each succeeding class day overdue item;
 - c. Recalled material — \$1.00 per day for each book or record to a maximum of \$10.00 per book or record.
2. Lost library materials:
 - a. Replacement cost of lost material plus
 - b. Processing fee of \$3.00 per lost item.
3. Accumulated fines:
 - a. Students who have lost library materials and fail to notify library authorities of their loss within two weeks of the mailing of official notification of delinquency must pay accumulated fines up to \$10.00 per book or record plus the replacement and processing fees levied for each lost item.

Circulation Regulations

Books may be borrowed for a period of two to four weeks and may be renewed unless they have been requested by other students or by faculty members.

Library Hours

Monday — Thursday	8:00 am — midnight
Friday	8:00 am — 5:00 pm
Saturday	9:00 am — 5:00 pm
Sunday	2:00 pm — midnight

Holiday hours for each of the Libraries will be posted. During vacations, the Libraries will be open from 8:00 am to 5:00 pm, but will be closed on weekends. Libraries open on the day before classes resume.

Career Development

Career Development is an ongoing process evolving from one's own personal history, feelings and experiences. It involves evaluating your abilities, interests, values and preferred life-styles; then using this information to develop satisfying, realistic and flexible education, work, and leisure plans.

If you are experiencing a degree of uncertainty, anxiety or confusion around a choice of major, career goals, mid-career changes or re-entering the job market, then you may benefit from Career Development Counseling. Students having questions about careers or considering a career change may schedule an appointment to discuss their career concerns. The Career Development staff especially encourages entering, first, and second year students to do so. Specific Career Development Services are available through the Continuing Education Office. The following are available by appointment:

Career Development Counseling

You may schedule a one-session Career Development Consultation appointment with a counselor or a three-session Career Counseling and testing package. Call the Continuing Education Office to schedule your appointment.

Career Development Planning Workshop

A workshop designed to introduce participants to life/work planning and to review some decision-making skills involved in planning a satisfying and rewarding balance between leisure, education, and work. A vocational interest inventory will be administered and participants will have an opportunity to identify marketable skills. The workshop will be six sessions. Register with the Continuing Education Office and once a group is formed, you will be contacted.

Testing

A computer-scored vocational interest inventory is available as part of the three session career counseling and testing package. Testing is not designed to provide automatic answers for your career direction. It will, however, provide a tool for your career development. The Career Development Counselor will interpret your test results and develop a more comprehensive approach to your career development.

Career Development Resource Library

The Career Development Resource Library has a variety of career and college major reference materials, government publications, selected directories and career newsletters available for all students exploring career change or deciding on a major. Call Continuing Education for an appointment.

Please note that all services are confidential and free of charge for all Continuing Education students. Also, appointments for all career development services listed should be scheduled with the Career Development Specialist through the continuing Education Office, located in the lower level, Cumnock Hall, North Campus, 452-5000, extension 2221.

Career Planning and Placement

During each semester, a representative of the Placement Office is in residence one evening a week at the Continuing Education Office. Evening students are able to get expert counseling in career planning or change, in resume preparation and the latest interviewing techniques, as well as up-to-the-minute information on the scheduling of campus recruiting by business and industry.

Some of the services provided by the Career Planning and Placement Office are: career planning information, career research materials, resume preparation workshops, interview/job marketing workshops, career/professional days, company pre-interview meetings, and on-campus recruiting interviews.

The focus of Career Planning and Placement Services is upon the student — not only immediately before or after graduation, but also during the earlier undergraduate years. Its goal is to assist the student to understand his or her personal interests and abilities and to define vocational objectives which are personally meaningful and satisfying.

The Director of the Placement Office is available without appointment. Individual consultation throughout the academic year is always welcomed. The Career Planning and Placement Office is on the first floor of Southwick Hall, North Campus.

Directions to University of Lowell

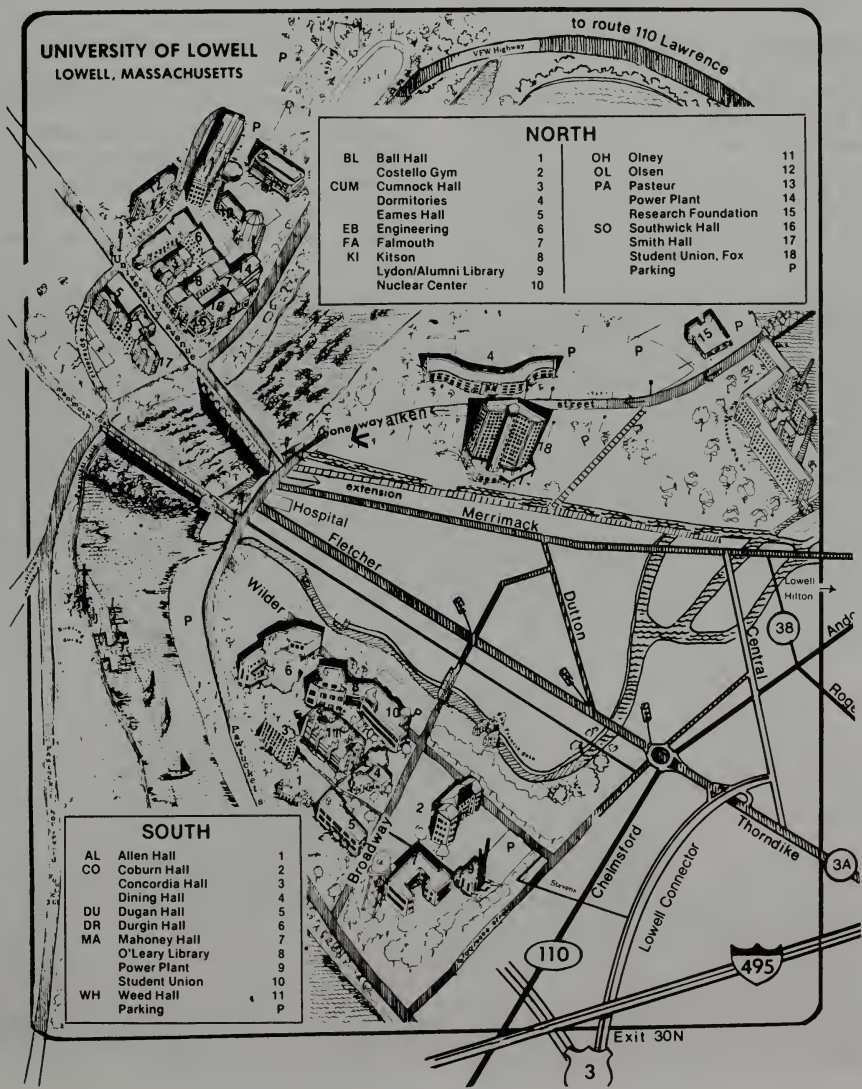
The three main approaches to the Lowell area are: I-93, I-495 and U.S. 3.

To the Lowell area we recommend:

- From Boston & South Shore — I-93 North
- From New Hampshire & Vermont — I-93 South
- From Southwestern New Hampshire — U.S. 3 South
- From Southeastern Massachusetts and Rhode Island — U.S. 3 North
- From Eastern New Hampshire, Maine, and Northeastern Massachusetts — I-95 South to I-495 South to I-93 North
- From Worcester, Connecticut, and points West — I-90 (Mass. Pike) East to exit 10 (Auburn), I-290 North to terminus at I-495 North.

To University of Lowell North Campus we recommend:

- From I-93 — take exit 20 (Rtes. 110 & 113) pick up Rte. 110 West off rotary. Follow highway along north bank of the Merrimack River, 8 miles to the North Campus.
- From I-495 South — pick up I-93 North in Andover, to exit 20. Proceed as above.
- From U.S. 3 North and I-495 North — take the Lowell Connector to exit 5 (Thorndike Street). Follow to end and turn right. First left across bridge onto North Campus.
- From U.S. 3 south — take exit 35, Rte. 113 East across Merrimack River. Rte 113 continues at first right immediately after bridge. Follow 5 miles to North Campus.



General Policies

Policy Changes

Although the Office of Continuing Education provides notice concerning changes as is reasonably practicable under the circumstances, the University reserves the right to change requirements, subjects, courses, regulations and other policies stated in this bulletin. The University its sole judgment reserves the right to close a course registration, cancel a course, alter the scheduled time, or change the scheduled night without formal notice.

Continuing Education and Evening School classes usually will not be cancelled for reasons of inclement weather. The difficulty of notifying all students and instructors individually in sufficient time makes this policy necessary. The University does reserve the right to cancel classes for emergency reasons.

Special Students

Students who wish to register for a single course in the undergraduate degree programs may do so provided they have the necessary prerequisites. Tuition will be charged at the regular rate, and credit will be awarded for the successful completion of such courses. However, the applicability of such credit to University degree programs may be subject to other policies of the University and/or to specific program requirements. Admission to course status does not constitute admission to specific programs or to matriculation status.

Attendance

Students must attend 80 percent of all classes held in their courses. More than three unexplained absences may cause a student to be dropped from the rolls with a grade of "F" in the course. Examinations or other work missed by absence may, at the option of the instructor, be made up or failed.

Audit

Courses may be taken for Audit only as a review for courses previously taken and passed. Permission of the Associate Director must be obtained in order to take an audit course.

Federal Benefits

All students entitled to benefits under federal law must (1) complete the Application for Admission form and (2) declare a program of study in order to be eligible for these benefits.

Veterans who are entitled to educational benefits under federal law and are attending the University for the first time must submit appropriate

forms to the Continuing Education Office. (These forms are available from the Continuing Education Office or local V.A. Office.) In addition, all veterans must submit a high school transcript and a transcript of all post-secondary education before registering in any program. Veterans who have not previously used benefits must also submit: a DD 214, marriage certificate, and birth certificates of children, if applicable.

Student Responsibility

To be admitted to and enrolled in a scheduled class, students must present to the instructor a validated class card which is issued by the Continuing Education Business Office upon payment of fees.

The identification card issued by the University must be carried by the student on his person while attending classes.

It is the responsibility of the student to become familiar with the scholastic regulations in regard to attendance, scholastic standards, withdrawals, etc., as stated in this bulletin. An administrative assistant is assigned to the Evening School Office from 6:30–10:00 p.m. throughout the school year to advise students about these matters.

Students must pay for university equipment which they have broken or damaged, provided that such breakage does not occur while the student is under direct supervision of the instructor.

In some instruction, the student is required by law to wear safety glasses or other safety devices. The instructor of such classes will inform students of their obligation to obtain and wear the necessary safety protection.

Administrative Dismissal*

A student may be administratively dismissed from the University through cancellation of registration for due cause, through expulsion for academic dishonesty, and through disciplinary procedures for violations of good conduct.

Non-Academic Dismissal*

Administrative dismissal may be invoked when a student fails to comply, after due notice, with an administrative requirement of the University. Administrative dismissal is noted on the permanent record card by the symbol "Y" for each course registration. An administratively dismissed student who wishes to be reinstated must file an application for readmission with the Office of Continuing Education. Such reinstatement will be granted only if the condition which has necessitated administrative dismissal has been ameliorated to the satisfaction of University officials. Examples of conditions which may justify administrative dismissal include:

Forgery or fraudulent use of University records, documents or forms (including unauthorized access to restricted computer files); Non-payment of official University fiscal obligations; and Failure to comply with duly authorized administration order relating to the safety of persons or the protection of University property.

Academic Expulsion*

Students who have evidenced academic dishonesty, including cheating and plagiarism, may be administratively expelled from the University. University departments and colleges have established procedures for adjudicating charges of academic dishonesty and for establishing penalties up to and including administrative dismissal. Students expelled from the University for academic dishonesty shall fail those courses in which the dishonesty has taken place.

Class Schedule

Classes in the Evening School undergraduate degree programs are scheduled from 7:00 to 10:00 p.m. on Monday, Tuesday, Wednesday, Thurs-

day, and Friday evenings as listed in the schedule on the inside back cover of this bulletin. Other hours are sometimes scheduled in certain courses, in which case, the hours are listed in the schedule of classes published each semester.

Size of Class

Those classes which do not register a minimum of 15 students may be cancelled. The number of enrollments during preliminary registration is an important factor in determining the schedule of courses; thus to ensure the scheduling of desired courses students are urged to participate in the preliminary registration.

Books and Supplies

Students must provide their own books, paper, drawing materials, and other supplies. Required texts and supplies are sold by the University's bookstores at scheduled times in the evening. The bookstore schedule is posted on the Evening School bulletin board, ground floor, Cumnock Hall.

**See the General Catalogue, University of Lowell for further information.*



Registration Information

Early Registration

An early registration process for new applicants and previously enrolled students enables the Evening School to schedule classes more efficiently, and to provide for adequate instruction in courses which would otherwise be oversubscribed. The process allows the student to stipulate a preferred day and hour for multi-section courses.

Walk-in Registration

Students register by completing the necessary forms and paying the required fees before commencement of classes. Registration is held on the dates indicated in the calendar (inside front cover). During this registration period the Business Office is open from 6:00 to 8:30 p.m. **A student is not officially registered until tuition and all other fees have been paid and the class cards have been validated by the Continuing Education Business Office.** These cards are required for admission to class. Students must also obtain an identification card during the registration period.

Late Registration

Late registration is permitted until the end of the second week of classes. A late registration fee of \$10.00 will be assessed in addition to regular tuition charges and other fees. No student will be admitted to a class after the third meeting. **No class changes are accepted after the end of the second week of classes.**

Summer Program

Selected courses are offered during the summer. The subjects offered depend upon student demand and may vary from year to year. For each course passed during the summer, students receive full credit on the same basis as for work done during the fall or spring semesters. Costs and other information are available at the Evening School Office before the start of the summer session.

Program Planning

An administrative assistant is available at the Evening School Office through the school year while classes are in session. Assistance in program planning is also available during the scheduled registration period each semester. However, **students are strongly advised to seek counseling during the school year so that they may participate in preliminary registration.**

Transfer Credit

If a student wishes to request transfer credit he must submit an official transcript of grades for work done elsewhere, together with a catalogue or

other description of the courses taken. Transcripts from other schools must be received before a student completes his second semester of work at the University. No request for transfer credit will be considered until all the required material has been submitted. Credit will be allowed for work completed at accredited institutions (subject to the limitations listed below) which is deemed equivalent to University of Lowell instruction, and for which the student has received a grade equivalent to a "C" or higher by University of Lowell standards.

Grades of transferred courses, however, will not be computed in a student's cumulative rating at the University of Lowell. Transfer subjects will be recorded with the notation "Cr" which designates that credit only has been granted.

Transfer credit will not be granted in the following instances:

1. For work completed at non-public institutions which are not accredited by the major accrediting associations;
2. For work which was not acceptable to the transfer institution for its own associate or baccalaureate program;
3. For work completed through extension programs or adult-enrichment programs;
4. For work which was completed more than ten years prior to the date of application to the University of Lowell for transfer credit.

Students who are able to demonstrate competence in the subjects for which transfer credit is denied by passing special departmental examinations or through the CLEP program may be awarded credit by the University.

The University of Lowell has affirmed its intention to maintain flexibility in the transfer of qualified students of the Commonwealth of Massachusetts. For the implementation of this objective, the University of Lowell has subscribed to the Massachusetts Transfer Compact.

University of Lowell Day School students who wish to transfer to the Evening School must follow University regulations as noted in the General Academic Rules of the University (Day School). Students with satisfactory academic standing and students who have been placed on warning may petition for intercollegiate transfer to the Evening School.

Day School Classes

Students who are matriculating for associate or baccalaureate degrees in the Evening School of Continuing Education may be permitted to pursue specifically authorized day courses. Such students

must secure the written approval of their program coordinators for all projected courses prior to filing an application with the Office of University Admissions. Full notation of all approved courses (including those which have been failed) is made upon the permanent record card of Continuing Education students, and the grades earned are included in the cumulative grade point average.

Off Campus Study

Individuals who have been admitted to the Evening School may be permitted to apply off-campus courses to their degree programs when they comply with established procedures. Off-campus courses may be taken in accredited insti-

tutions only and ordinarily should be taken at baccalaureate colleges or at universities. Permission to pursue off-campus courses in accredited associate degree institutions may be granted only for courses which are to be presented for lower-division requirements of University of Lowell curricula. All off-campus courses must be taken under the regular grading system, may not be taken on a "pass-fail" or "pass-no record" basis, and are treated as transfer courses. To insure recognition of off campus courses, students should request permission to take off-campus subjects by completing an academic petition form and securing written authorization from their curriculum coordinator.

Tuition and Fee Information

Tuition and Academic Service Fees

Tuition charges are \$54.00 per credit hour for a lecture course, and \$54.00 per contact hour for a laboratory course or for a course which meets for more hours per week than it carries credits. Academic Service Fee charges are \$4.00 per credit/contact hour. Tuition charges for Audit courses are \$20.00 per credit/contact hour. There will be an increase in tuition of \$3.00 per credit/contact hour in the Spring semester.

Registration Fee and Insurance Fund

A payment of \$11.00 per semester in addition to tuition and other charges is required of all students for registration and for compulsory insurance. This payment is not refundable.

The compulsory fee, approved by the Board of Trustees of the University of Lowell, provides an accidental medical insurance plan to cover registered students in Continuing Education while on the premises of the University for scheduled instruction or while engaged in any supervised activity sponsored by Continuing Education. Payment will be made for medical expenses from such accidents up to a maximum of \$1,000.00. Claim forms can be obtained from the Evening School Business Office and submitted to the doctor or hospital, if possible, at the time of treatment. Benefits are paid directly to the medical facility. All accidents should be reported to the Security Office as soon as possible.

Late Registration Fee

A late registration fee of \$10.50 is charged any student who registers after the regular registration date as listed in the calendar on the inside cover of this bulletin. This fee is assessed in addition to usual registration and insurance fees. This payment is not refundable.

Laboratory Fee

A \$27.50 laboratory fee is charged any student who registers for a laboratory course. This payment is not refundable.

Tuition Refund

Any eligibility for tuition refund is based on the academic calendar not class attendance and is prorated as follows. Fees are not refunded unless Continuing Education is responsible for Cancellations.

Withdrawal before 1st meeting	100%
From the 1st but before the 2nd	90%
From the 2nd but before the 3rd	50%
From the 3rd	no refund

The refunding process normally requires at least a period of 4-6 weeks from the time the refund is submitted. Students desiring refunds must file an application form obtainable at the Evening School Office.

College Fees

The following college fees have been established by the Board of Trustees:

College of Engineering	\$4.55 per credit/contact hour
College of Health Professions	\$2.30 per credit/contact hour
College of Pure and Applied Science	\$4.55 per credit/contact hour

These fees will be assessed for most courses offered through these colleges.

Payment of Bills

A student in debt to the University at the end of any semester or summer session for fees or other charges is not permitted to register again at the University until his or her indebtedness has been discharged. Such a student who has been preregistered shall have his or her registration cancelled without further notice if payment of previous indebtedness has not been made prior to the beginning of classes for the following semester. Grade reports and transcripts of students will not be released unless all indebtedness has been discharged.

Admission and Degree Program Matriculation Information

General Requirements

Entrance to all undergraduate degree programs offered by the Evening School requires graduation from a recognized high school or equivalent such as a Massachusetts High School Equivalency Certificate. Each student must submit his high school transcript or equivalency certificate prior to matriculation. In addition, students desiring to enter associate or baccalaureate degree programs must have the following qualifications at the time of application:

For Business and Public Service Programs — Two years of mathematics of which one year must be algebra.

For Technology and Science Programs — A minimum of two years of mathematics with one year of algebra and one year of plane geometry.

For the Nursing Program — Licensure as a registered nurse. It is also recommended, but not required, that applicants have two years of mathematics, including one year of algebra. Students not possessing this background in mathematics should seek guidance before registering for the computer and statistics courses.

Admission to a Degree Program

Students who wish to pursue a Continuing Education program at either the associate or baccalaureate degree level should complete an Application for Admissions form at the time of their initial registration and, in any event, upon the completion of 18 credits at the University.

Students not completing the admissions form — and therefore not declaring a major (or program) — will be categorized as “special students” and are ineligible for federal assistance benefits. Some faculty advising, such as evaluation of transfer credits, will not be available to special students.

University retention standards are initially applied to both admitted students and special students after earning 12 credits at the University. All students must subsequently meet specified minimum grade-point requirements to continue.

University Requirements for Associate Studies

Students must meet all the requirements of the program as noted in the **Bulletin of Undergraduate Studies of Continuing Education**. In addition, each student must complete at least 9 semester credits in regular course work with his/her major department and must complete at least 24 semester credits in the Evening School of the University of Lowell.

Additional Associate Degree

A student may pursue an additional associate degree under the same regulations set forth for pursuing an additional baccalaureate degree except that the number of credits required are 24.

University Requirements for Baccalaureate Studies

All baccalaureate candidates are required to obtain a 2.00 ("C") cumulative average in their total course of study, to present a minimum of 120 semester hours of course credits, to fulfill the residency requirement, to conform to the general regulations and requirements of the University, to satisfy the regulations and academic standards of the colleges which exercise jurisdiction over the degrees for which they are matriculating, to satisfy the curriculum requirements established by the departments or programs in which they are majoring, and to complete the following core requirements:

University Core Requirements

English Composition Requirement (6 Semester Credits.)

All students must pass a sequence of two courses totaling six semester credits in composition (42.101 College Writing I and 42.102 College Writing II), normally taken in the freshman year.

Area Distribution Requirements (27-29 Semester Credits.)

A minimum of two courses and six semester credits must be selected in Area I; a minimum of two courses and six semester credits must be selected in Area II; and two additional courses (six semester credits) must be selected from either of these areas. The Area I and II requirements specify a total of six courses and eighteen semester credits.

Approved Area I courses — 6 credits required —

COURSE	TITLE	CREDITS
43.105	Western Civilization	3
43.106	The Modern World	3
43.111	U.S. History to 1877	3
43.112	U.S. History Since 1877	3
43.228	The American Indian	3
43.239	American Economic History	3
43.308	History of Crime, Conflict and Social Control in the U.S.	3
43.314	American Social History Since 1880	3
43.324	Rise of Industrial America	3
46.101	Intro American Politics	3
46.121	Intro International Relations	3
46.282	Contemporary Political Theory	3
47.101	General Psychology	3
47.163	Human Life Span	3
47.209	Social Psychology	3
47.232	Psychology of Personality	3
47.255	Community Psychology	3
47.262	Adolescent Psychology	3
47.272	Abnormal Psychology	3

47.328	Dynamics of Interpersonal Relations	3
47.364	Psychology of Crime & Corrections	3
48.101	Introduction to Sociology	3
48.201	Social Anthropology	3
48.234	The Study of Minorities	3
48.341	Social Stratification	3
48.361	Sociology of Law and Criminal Justice System	3
68.201	Economics I	3
68.202	Economics II	3
68.307	Government, Business & Society	3

Approved Area II courses — 6 semester credits required —

COURSE	TITLE	CREDITS
42.201	Great Books of Antiquity	3
42.203	Great Books of the Modern Period	3
42.205	Human Values in Western Culture I	3
42.206	Human Values in Western Culture II	3
42.217	Horror Story	3
42.267	Shakespeare	3
42.291	History of English Lit I	3
42.292	History of English Lit II	3
42.294	History of American Lit I	3
42.295	History of American Lit II	3
45.201	Intro to Philosophy	3
45.202	Intro to Logic	3
45.203	Intro to Ethics	3
50.211	Intermediate French I	3
50.212	Intermediate French II	3
54.211	Intermediate Spanish I	3
54.212	Intermediate Spanish II	3
57.255	Drawing I	3
58.101	Appreciation of the Visual Arts	3
58.203	Survey of Art I	3
58.204	Survey of Art II	3

A student also must present a minimum of three courses (nine to eleven semester credits) in Area III; one course must be in a laboratory science (or its equivalent), a second course must be in Mathematics, and a third course shall be in either science or mathematics. The Area III requirement specifies three courses and nine to eleven semester credits.

Approved Area III courses

Science/Laboratory Courses 3 or 4 semester credits required —

COURSE	TITLE	CREDITS
83.101	Life Science I	3
83.102	Life Science II	3
83.103	Life Science I Lab	1

The student must register for corequisite laboratory wherever applicable.

Mathematics Courses — 3 credits required —

COURSE	TITLE	CREDITS
92.265	Introduction to Pascal	3
92.383	Introduction to Statistics	3

Science/Non-laboratory Courses — 3 semester credits required —

COURSE	TITLE	CREDITS
89.101	General Geology I	3
92.265	Introduction to Pascal	3
92.383	Introduction to Statistics	3

In fulfilling the distribution requirement, a student is limited to a maximum of two courses in any one department. Additionally, a student is limited to two courses in literature, irrespective of departmental listing.

Human Values Requirement (3 semester credits)

All students are required to pass one Human Values course which emphasizes the making of ethical and humane decisions. Unless a department indicates that the Human Values Requirement is satisfied by a designated department requirement, students must elect and pass one of the following:

Approved Human Values Courses — 3 semester credits required —

COURSE	TITLE	CREDITS
42.205	Human Values in Western Culture I	3
42.206	Human Values in Western Culture II	3
45.201	Introduction to Philosophy	3
45.203	Intro to Ethics	3
46.282	Contemporary Political Theory	3
47.209	Social Psychology	3
48.201	Social Anthropology	3
68.307	Government, Business & Society	3

Residency Requirements

In addition to satisfying specific course and achievement requirements, each baccalaureate

candidate must complete at least 15 semester credits in regular course work within major departments of the University for each major which is presented for a degree. Each candidate for a baccalaureate degree must also satisfy one of the following residency requirements:

1. Complete not less than 90 semester credits at the University and complete the remainder of the prescribed courses of study at another accredited baccalaureate institution, earning not more than 30 semester credits at that institution.
2. Complete an associate degree under the provisions of the Massachusetts Transfer Compact in a Massachusetts Community College, earning not more than 60 semester credits, and the remainder in courses of the University, earning not less than 60 semester credits;
3. Complete up to the first two years in an accredited associate institution earning not more than 60 semester credits (with "C" grades or better), and the remaining years in courses of the University, earning not less than 60 semester credits. Individuals transferring from a Massachusetts Community College who have not completed the associate degree may receive recognition only for credits with grades of "C" or better; or
4. Complete up to the first three years of a baccalaureate program in an accredited four-year institution, earning not more than 90 semester credits, ("C" grades or better), and the remaining courses in the University, earning not less than 30 semester credits.

Except that all candidates for a baccalaureate must present a minimum of 30 semester credits of study in University evening classes, the above cited residency requirements for University study may be satisfied through other than the attendance of evening classes, for example: established course-equivalency procedures and authorized day courses in the University.

Upon approval of the appropriate curriculum Coordinator, the course requirements of 15 credits with the major department and up to 15 credits of the minimum University residency requirements may be satisfied through completion of day courses of the University.

Additional Baccalaureate Degree

A student who has earned a baccalaureate degree at the University of Lowell or at another accredited baccalaureate institution may be admitted to the University to pursue an additional baccalaureate degree in accordance with the following: (1) the nomenclature of the additional degree to be pursued must be distinctly different from the previously conferred degree; e.g., Bachelor of Arts, Bachelor of Science, Bachelor of Music, Bachelor of Science in Engineering, Bachelor of Science in Business Administration, etc., (2) the major field of the previous degree must be clearly

distinct from that of the additional degree, (3) the work for the additional degree must consist of not less than two semesters of full-time residence (or its Continuing Education equivalent), (4) the final 30 credits presented for the additional degree must be in addition to and independent of any previous baccalaureate, and (5) a minimum of 15 credits must be taken at the University in the major field which is presented for the additional degree. If any of the first three years of credit has been transferred from another institution, the candidate for the additional baccalaureate degree must earn a minimum of 30 semester credits of uninterrupted residence at the University.

Grading Information

Grading System

The following qualitative letter grades are employed by the University to characterize the quality of a student's work in a course:

- "A" designates that the work done by the student is superior and is of the highest honors quality;4
- "AB" designates that the work done by the student is less than superior but is completed with a level of distinction which is higher than the basic honors level; 3.5
- "B" designates that the work done by the student is of basic honors quality; ...3
- "BC" designates that the work done by the student is less than honors quality but is better than satisfactory; 2.5
- "C" indicates satisfactory work which conforms to the general expectations of the University for baccalaureate study;2
- "CD" indicates that the work done by the student is less than satisfactory and below graduation standards but is better than the minimum requirement for passing a course; 1.5
- "D" indicates work which meets the minimum requirement for passing a course;1
- "F" designates course failure.....0

In addition to the above letter grades, the following symbols are also used to designate special enrollment provisions or course statuses and do not affect the student's academic average:

- "S" designates satisfactory completion of a practicum experience course with a grade of "C" or higher;
- "U" indicates unsatisfactory performance in a practicum experience course with a final course grade of less than "C;"
- "I" indicates a course which has not been completed;
- "W" designates official withdrawal from a course within the established deadline.
- "X" designates student withdrawal after the established deadline for administratively approved reasons for an emergency or medical nature;
- "Y" designates administrative dismissal for other than academic reasons;

"AU" designates that the student has registered for a course on an "audit" basis and has maintained an attendance record throughout the semester which is sufficient to warrant an official recognition of his course attendance.

Withdrawal

"W" is not an academic grade but a symbol designating **official** withdrawal from a course within the established deadline of the eighth (8) week of class of a semester. Official withdrawal is accomplished by filing a "Withdrawal Form" with the Evening School Office. A notation of "W" cannot be given for unofficial withdrawal from a course or for unofficial withdrawal from the University. Accordingly, a student who registers for a course and is carried on an official class roster after the eighth week of a semester must be graded in terms of the completion of the instructor's total course requirements even though the student did not attend any class meeting or unofficially left the University before the eighth week of the semester. A student who wishes to withdraw from a course after the deadline of the eighth week must submit a petition to the Evening School. An "X" will be given only when it can be demonstrated that **extended** illness or a critical personal emergency of an **extended** nature prevented the student from complying with official withdrawal procedures. **Students receiving benefits from the Veterans Administration are not eligible for retro-active withdrawal from courses.**

Incomplete

An Incomplete ("I") is given at the discretion of the instructor; students should not take it for granted that they will receive an Incomplete without first consulting with the instructor. However, responsibility for completing all outstanding work rests entirely with the student. The Incomplete notation carries with it a reserve letter grade; if all outstanding work is not acceptably made up and submitted within a four-week period following the final examination, the "I" will automatically become whatever the instructor has designated as this reserve grade. If the work is satisfactorily completed within the designated time, the instructor will replace the "I" notation (and its reserve grade) with an appropriate letter grade. Outstanding work may be made up after the four week period, but arrangements for this make-up must be completed within the original four-week period and permission of the Director of Continuing Education must be obtained for the extension of time.

Repeated Course Work

Students must repeat and pass all **required** courses which they have failed. Any failed course which is a prerequisite for another must be repeated and passed before the student can take the advanced course.

Students may repeat a limited number of courses in which they received a grade of “F” and have the repeated grade substituted for the original grade in the computation of the cumulative grade-point average. Non-probationary students must repeat courses within 36 semester hours following their course failures. Although probationary students may not invoke the grade substitution provision during their periods of probation, they may invoke the grade-substitution process upon removal from probation. Students entering as freshmen or transferring with less than 60 semester credits are permitted a maximum of 10 credits of course repetition for grade substitution; students trans-

ferring with 60 or more semester credits are permitted a maximum of 7 credits of course repetition for grade substitution. Students must designate by petition which courses are being repeated for the purpose of grade substitution **before** re-enrolling.

Prior to an initial determination of academic progress a student may not repeat courses for grade substitution.

Students may repeat a passed course within the provisions of the grade substitution rule cited above, however; if the grade of the repeated course is less than the original grade, both grades will be used in computing the grade point average.

Remedial Courses

Any course in a sequence of courses which is at a lower level than the required courses in the program will be considered a remedial course and is not acceptable as an elective in the program: e.g. 90.010, 90.111.

Academic Standing

Grade-Point Requirements

Each student is subject to the following grade-point requirements for the specified numbers of completed course hours. These grade-point averages are minimum University requirements; individual colleges or departments may establish higher standards.

Course Hours Attempted*	Grade-Point Averages for Satisfactory Standing+	Grade-Point Averages for Academic Warning+	Grade-Point Averages for Academic Suspension+
12-30	1.500	1.400-1.499	1.399 or below
31-45	1.600	1.500-1.599	1.499 or below
46-60	1.700	1.600-1.699	1.599 or below
61-75	1.800	1.700-1.799	1.699 or below
76-90	1.900	1.800-1.899	1.799 or below
91-graduation	2.00	1.900-1.999	1.899 or below

*Included in “Course Hours Completed” are all course credits which have been granted (including credits awarded through transfer and challenge by examination, course credits which have been awarded with grades) and all hours of course work which have been failed with the qualitative letter grade of “F”.

+Specified “Grade-Point Averages” are computed solely on the basis of those courses completed at the University of Lowell or through University auspices under previous policies which governed authorized off-campus study and which were qualitatively evaluated with the following letter grades: “A”, “AB”, “B”, “BC”, “C”, “CD”, “D”, and “F”.

At the end of each official grading period, the Office of Continuing Education automatically

evaluates the cumulative averages of all matriculating students for compliance with University retention standards. Students whose cumulative grade-point averages are below retention requirements at the end of any official grading period have not made satisfactory academic progress and are so notified on their computerized grade report. Students whose cumulative grade-point averages fall below the requirements for their attempted course credits by more than 0.10 are immediately suspended. Students whose cumulative grade-point averages are not more than 0.10 below the requirements for their attempted course credits are placed on academic warning. Students who have been placed on academic warning must achieve satisfactory standing upon the completion of 15 additional hours of course work or they will be suspended from the University.

At the end of the Spring grading period, the Office of Continuing Education automatically evaluates the cumulative averages of all students for compliance with University retention standards. Students whose cumulative grade-point averages are below retention requirements at the end of any official grading period have not made satisfactory academic progress and are so notified on their computerized grade report. Students whose cumulative grade-point averages fall below the requirements for their attempted course credits by more than 0.10 are immediately suspended. Students whose cumulative grade-point averages

are not more than 0.10 below the requirements for their attempted course credits are placed on academic warning. Students who have been placed on academic warning must achieve satisfactory standing upon the completion of 15 additional hours of course work or they will be suspended from the University.

Academic Probation

A student who has been suspended from the University as a matriculating student in the Evening School is entitled to apply to the Office of Continuing Education for readmission as a probationary student in accordance with procedures enumerated under the admission policy heading "Probationary Readmission." Students who are readmitted on probation will receive a letter from the appropriate Academic Standards Committee* which specifies their probationary courses and the academic average which they must achieve during their designated probationary period in order to achieve satisfactory academic standing.

A student who achieves the required academic average during his or her probation is automatically reinstated as a student in satisfactory academic standing. A student whose academic average falls below the required average for his or her designated probationary period by no more than 0.10 may be granted an extension of the probationary period which will permit the completion of an additional 15 credits. Such extension of probation, if granted, will be made by the appropriate Academic Standards Committee during the period between semesters. Students who are granted such extensions will be notified in writing prior to the beginning of classes for the following semester that they have been granted an additional probationary period to achieve satisfactory academic standing. Students who fail to achieve satisfactory academic standing and are not granted extensions of their probations by the appropriate Academic Standards Committee and students who are granted such extensions and fail to achieve satisfactory academic standing by the end of the designated period are permanently dismissed from the University and are subsequently barred from attending both day and evening courses.

Students who have been readmitted on probation may not invoke University regulations which govern course repetition for the purpose of deleting course grades from cumulative averages.+ Nor may they withdraw from any course unless they withdraw from the University with permission of the Associate Director of Continuing Education for reasons of an emergency or medical nature. A probationary student who withdraws from any

course without authorization of the Associate Director of Continuing Education cannot by definition satisfy the conditions of his or her probation and will be permanently dismissed from the University at the end of the current semester of enrollment.

Probationary students who receive course evaluations of "I" (incomplete) and who fail to make-up their work under the regulations of an "I" grade are advised that they may not qualify for extension of their probation, may not register for nor attend University courses (including summer courses), and may not receive authorization to pursue off-campus studies until such time as a final determination of their status has been made.

Accordingly, probationary students are advised that they should not delay completion of course work until the make-up deadline which has been established for students in satisfactory academic standing unless they wish to postpone resumption of their studies. Students who have received permission of the Associate Director of Continuing Education to extend their make-up period are advised that such authorized extension does not waive the requirement for a final determination of academic standing which is based upon grades for all probationary courses.

*Students seeking probationary readmission to Continuing Education associate degree programs are reviewed by the Academic Standards Committee of the Evening School. Applications for probationary readmission to baccalaureate programs are reviewed by Academic Standards Committees of the appropriate college or their designees.

+Following the attainment of satisfactory academic standing and removal from probation, a student who has failed a course during the two semesters preceding suspension and has repeated and passed such a course during his or her probationary period may retroactively invoke the provision which permits deletion of the course failure from the cumulative grade-point average.

Probationary Readmission

A student who has been suspended from the University as a student in the Evening School is entitled to apply for readmission as a probationary student but may not initiate his or her probationary studies before an absence from the University for one semester. Application for such readmission to all programs of the Evening School is made through the Office of Continuing Education in accordance with prescribed procedures and must be received by April 1 for readmission decision during the Spring Semester and by November 1

for readmission decision during the Fall Semester. Petitions which have been received by the filing deadline of November 1 will be reviewed by the Standards Committee during the Fall Semester and readmitted students will be permitted to initiate their probationary studies at the beginning of the Spring Semester. Similarly, petitions which have been received by the filing deadline of April 1 will be reviewed by the Academic Standards Committee during the Spring Semester and readmitted students will be permitted to initiate their probationary studies at the beginning of the Fall Semester. The Academic Standards Committees may authorize a Continuing Education student to initiate probationary studies during the summer school if he or she has made such a request when filing an application for readmission.

Upon receipt of an application, the Office of Continuing Education will forward all readmission papers to the appropriate Academic Standards Committee.

In determining such requirements for probation, the Academic Standards Committee shall prescribe a sufficient number of courses (12 to 18 credits) which shall make the achievement of satisfactory academic standing reasonably possible during the designated probationary period.++ For complete information regarding Academic Standing, refer to the General Catalogue of the University of Lowell.

WARNING — Students who attend another institution while on suspension from the University must petition to have their courses accepted for transfer credit only after successful completion

of the probationary period. Inasmuch as these courses would have been taken without permission of the curriculum coordinator, it is possible that such petition could be denied.

DAY SCHOOL STUDENTS

DAY SCHOOL STUDENTS OF THE UNIVERSITY OF LOWELL WHO ARE ON ACADEMIC SUSPENSION **MAY NOT TAKE COURSES THROUGH CONTINUING EDUCATION.** SUSPENDED STUDENTS WHO WISH TO TRANSFER TO THE EVENING SCHOOL MUST CONSULT WITH THE REGISTRAR OR THE ASSOCIATE DIRECTOR OF CONTINUING EDUCATION PRIOR TO APPLYING FOR READMISSION.

++After securing recommendations from appropriate program coordinators and studying the previous academic record of the student, the Academic Standards Committee will lay down the requirements which the student must satisfy as a condition for his or her probation (specific courses to be taken, conference schedules with program coordinators), and any other special or general academic conditions which may be construed as necessary for the student's successful completion of his or her probationary studies.

++Since program transfer is permitted only for students in satisfactory standing, students who have been suspended for inadequate scholarship may apply for readmission as probationary students only to the program in which they are enrolled.

Determination of Undergraduate Class Standing

Freshman Standing	0-29 semester credits
Sophomore Standing	30-59 semester credits
Junior Standing	60-89 semester credits
Senior Standing	90 or more

Graduation Information

Graduation Interview

It is the responsibility of each student to arrange for a graduation interview at the Office of the Evening School early in the fall semester of the school year in which the student plans to qualify for a degree.

Students who expect to complete their degree requirements in the fall must complete the interview by the last day in OCTOBER; students who expect to complete their degree requirements in the Spring or Summer terms must complete their interview by the last day in FEBRUARY.

Failure to complete the interviews by the required dates may result in the student's name not being included in the Graduate Program and the diploma not being available at the graduation exercises.

Students who complete all degree requirements but fail to apply for a degree through the graduation interview process must register for the next semester by paying the registration fee and then apply for the degree through the Director of Continuing Education.

Commencement Fee

A fee of 47.00 is required of graduating students and is payable on or before registration for the final semester in which the student qualifies for a degree. The fee covers such expenses as diploma, rental of cap and gown, invitations and other printing, and any other expenses approved or directed by the President of the University.

University Honors

The University awards degrees with three levels of distinction upon those graduating students who have exhibited exceptional scholastic records. To

be eligible for honor at graduation a student must have achieved a minimum grade-point average of 3.00 for all courses completed at the University and must have earned a minimum of 60 semester credits at the University as upperclass students, or a minimum of 30 semester credits for the Associate Degree. Additionally, each associate degree student must qualify for the percentile distribution cited below as applied by the Evening School to the total number of graduating associate degree students. A baccalaureate degree student also must qualify for the percentile distribution cited below as applied by each college to its total number of graduating students.

- Summa Cum Laude
99th through the 98th percentiles
- Magna Cum Laude
97th through the 90th percentiles
- Cum Laude
89th through the 75th percentiles

University Commencement

Graduation exercises are held once a year at the end of the spring semester. Undergraduates who have completed degree requirements during the fall semester or will complete the degree requirement during the summer term are permitted to attend commencement exercises and their names are listed in the commencement booklet. Attendance of commencement exercises is not compulsory but all seniors are required to pay the specified graduation expenses. Students who do not elect to attend commencement ceremonies may not be granted a refund of the commencement fee.

Conferring of Degrees

University degrees are awarded three times a year: (1) in June for students completing degree requirements during the spring semester, (2) in October for students completing degree requirements during the summer term, and (3) in February for students completing degree requirements during the fall semester. Individuals who wish to submit verification of degree completion to employers or to graduate schools during the period between the end of their final grading period and the conferring of degrees may obtain a letter of completion from the Director of Continuing Education. **DUPLICATE DIPLOMAS ARE NOT ISSUED FOR ANY REASON.**

Alumni Association

Associate degree and baccalaureate degree students in the senior year of their respective Evening School programs of study are eligible for membership in the Alumni Association. By filing an application with the Association, they may become active members who are entitled to vote and hold office in the Association.

Course Equivalency Procedures

The Evening School is in full accord with the principle of affording an opportunity for those who have college-level competence in any subject, regardless of how or where they have acquired it, to demonstrate their competence, and to have it recognized by the award of course equivalency credits toward the fulfillment of degree requirements. Students may apply for course equivalency credits up to a maximum of 42 credits; however, the total number of equivalency and transfer credits may not exceed 90 credits for the baccalaureate degree.

Course equivalency credits are awarded through successful completion of College Level Equivalency Program (CLEP) examinations. Departmental examinations will not be given if a corresponding CLEP examination is available.

Students interested in taking CLEP subject examinations must complete the "Request for Credit by Examination" form and obtain written approval from the program coordinator before taking the examination.

Students interested in taking departmental examinations must first arrange an interview, at which time they must present evidence that they possess sufficient competency to warrant a departmental examination. (Departments reserve the right to refuse the granting of credit by examination for those courses which are presented by a student for his major.) When written permission is given to a student to take a departmental examination, the conditions of the examination will be set forth. A \$25.00 examination fee must be paid before taking the examination.

Students may not request course equivalency credits for courses which they have audited or

failed or from which they have withdrawn. Course equivalency credit will not be granted if a course is lower in sequence than a course in which credit has been earned or if a substantial portion of the course material has been covered by another course.

General Examinations of CLEP may be presented for credit if scores of 500 or better have been obtained; however, credit for these examinations will be granted only to entering students who are initiating their college studies. It should be noted that general examination credits may not be applied to a student's degree requirements if a general examination is cognate with the student's academic major.

CLEP Examination	Maximum Semester Credits Allowed	Required Score
English Composition ⁺	3	600
Mathematics*	6	500
Natural Sciences [#]	6	500
Social Sciences	6	500
Humanities	6	500

⁺A student who achieves a score of "600" or above satisfies the requirement for College Writing I.

*Credit may be granted only to students who matriculate for degrees in the College of Liberal Arts and the College of Music.

[#]Credit may be granted only to students who matriculate for degrees in other than the College of Engineering, Health Professions, and Pure & Applied Science. Credit granted does not satisfy the specific laboratory requirement of the revised University Core Requirements.

College of Engineering

Aldo Crugnola, Dean; A.B., M.S., Ph.D.
Richard Meinsinger, Assistant Dean; B.S., M.B.A.
Mukti L. Das, Civil Engineering Technology Coordinator; B. Eng., M.S., Ph.D.
J. Robert Lemieux, Electronic Engineering Technology Coordinator; B.S., M.S.
G. Lawrence Thatcher, Industrial Technology Coordinator; B.S., M.S.
Majid Charmchi, Mechanical Engineering Coordinator; B.S., M.S., Ph.D.

The College of Engineering offers the following Continuing Education undergraduate programs: Associate of Science in Engineering Technology (Civil Engineering, Electronic Engineering, and Mechanical Engineering), Bachelor of Science in Engineering Technology (Civil Engineering, Electronic Engineering, and Mechanical Engineering), and Bachelor of Science in Industrial Technology [Options in Manufacturing Technology, Water and Industrial Waste Technology, and Plastics Technology].

I Civil Engineering Technology

Associate of Science & Bachelor of Science Programs

Suggested Course of Study
Years 1-4 Leading to the Degree of Associate of Science in Engineering Technology

FIRST YEAR

First Semester (Sept.)			Second Semester (Jan.)		
Subject No.		Credits	Subject No.		Credits
90.113	College Algebra	3	92.115	College Trigonometry	3
23.111	Engineering Drawing I	2	23.112	Engineering Drawing II	2
92.263	Fortran Programming.....	3	42.101	College Writing I	3
		<u>8</u>			<u>8</u>

SECOND YEAR

15.123	Surveying I	4	15.124	Surveying II	4
90.131	Calculus I	3	90.132	Calculus II	3
99.131	Technical Physics I	3	99.132	Technical Physics II	3
		<u>10</u>			<u>10</u>

THIRD YEAR

15.237	Statics	3	15.239	Strength of Materials	3
15.251	Highway Elements.....	3	15.243	Construction Materials	3
42.102	College Writing II	3	42.225	Technical & Scientific	3
		<u>9</u>	Communications		<u>9</u>

FOURTH YEAR

15.246	Introduction to Hydraulics.....	3	15.242	Steel Design I.....	3
15.251	Structural Analysis I	3	15.254	Soil Mechanics I	3
15.253	Reinforced Concrete I.....	3	15.255	Environ. Technology I	3
		<u>9</u>			<u>9</u>

Years 5-8 Leading to the Degree of Bachelor of Science in Engineering Technology.

FIFTH YEAR

First Semester (Sept.)			Second Semester (Jan.)		
Subject No.		Credits	Subject No.		Credits
15.391	Reinforced Concrete II	3	15.356	Environmental Tech. II.....	3
84.111	General Chemistry I	3	15.383	Steel Design II	3
84.113	General Chemistry I Lab	<u>1</u>	.....	Area II Elective	<u>3</u>
		7			9

SIXTH YEAR

15.392	Soil Mechanics II.....	3	15.394	Soil Mechanics Lab.....	1
15.352	Structural Analysis II	3	15.238	Dynamics	3
90.231	Calculus III.....	<u>3</u>	92.383	Intro. to Statistics	<u>3</u>
		9			7

SEVENTH YEAR

68.201	Economics I	3	68.202	Economics II	3
17.127	Electrical Fundamentals	3	99.133	Technical Physics III.....	3
.....	Area II Elective	<u>3</u>	.....	Technical Elective	<u>3</u>
		9			9

EIGHTH YEAR

15.463	Construction Technology	3	15.486	Transportation Elements	3
20.414	Industrial Economics Mgt.....	3	.....	Area I or II Elective	3
.....	Human Values Elective.....	<u>3</u>	.....	Technical Elective	<u>3</u>
		9			9

15.352, 15.356, 15.383, 15.392 are offered in odd years only.

15.391, 15.394,, 15.463, 15.486 are offered in even years only.

Technical electives MUST be approved by the Program Coordinator.

II Electronic Engineering Technology

Associate of Science & Bachelor of Science Programs

Suggested Course of Study
Years 1-4 Leading to the Degree of Associate of Science in Engineering Technology

FIRST YEAR

First Semester (Sept.)			Second Semester (Jan.)		
Subject No.		Credits	Subject No.		Credits
90.113	College Algebra	3	92.115	College Trigonometry	3
42.101	College Writing I	3	92.263	Fortran Programming	3
.....	Area II Elective	<u>3</u>	42.102	College Writing II	<u>3</u>
		9			9

SECOND YEAR

17.213	Electric Circuits	3	17.214	Circuits & Lab I	2
90.131	Calculus I	3	90.132	Calculus II	3
42.225	Tech. & Scientific Comm.	<u>3</u>	99.131	Technical Physics I	<u>3</u>
		9			8

THIRD YEAR

17.215	Circuits & Lab II	2	17.216	Advanced Circuits	3
17.355	Electronics & Lab I	2	17.356	Electronics & Lab II	2
99.132	Technical Physics II	<u>3</u>	99.133	Technical Physics III	<u>3</u>
		7			8

FOURTH YEAR

17.350	Control Systems I	3	17.380	Microprocessor Basics	2
17.353	Digital Electronics	3	17.371	Logic Design I	3
17.357	Electronics & Lab III	<u>2</u>	17.358	Electronics & Lab IV	<u>2</u>
		8			7

Students enrolling in this program should purchase an electronic calculator capable of handling logarithmic and trigonometric functions. The use of the calculator will be an integral part of courses 17.213 and 17.214, where proficiency will be developed. Competency in the use of the calculator will be assumed in all subsequent EE courses. All electives shall be chosen after conference with the Program Coordinator and **MUST** be approved by him. If electives are not properly approved, it is possible they will not be credited toward the degree requirement.

Years 5-8 Leading to the Degree of Bachelor of Science in Engineering Technology.

FIFTH YEAR

First Semester (Sept.)		Second Semester (Jan.)	
Subject No.	Credits	Subject No.	Credits
17.367	Digital Devices & Lab .....2	17.368	Data Conversion & Lab .....2
17.372	Logic Design II .....3	17.317	Minicomputer Prog. ....3
90.231	Calculus III .....3	90.232	Calculus IV3
	<u>8</u>		<u>8</u>

SIXTH YEAR

17.365	Applied Linear Devices.....3	17.361	Project Laboratory A .....2
92.234	Differential Equations.....3	17.376	Electromagnetic Theory I.....3
92.265	Introduction to Pascal .....3	17.382	Engineering Problem Solving3
	<u>9</u>		<u>8</u>

SEVENTH YEAR

17.4 ..	E.E.T. Elective .....3	17.4 ..	E.E.T. Elective .....3
17.4 ..	E.E.T. Elective .....3	.....	Human Values Elective.....3
.....	Area II Elective .....3	.....	Area I or II Elective3
	<u>9</u>		<u>9</u>

EIGHTH YEAR

64.201	Economics I .....3	68.202	Economics II .....3
17.391	Project Laboratory B .....2	17.392	Project Laboratory C .....3
17.4 ..	E.E.T. Elective .....3	17.4 ..	E.E.T. Elective .....3
	<u>8</u>		<u>9</u>

All other electives shall be chosen after conference with the Program Coordinator and MUST be approved by him.

If electives are not properly approved, it is possible they will not be credited toward the degree requirement.

III Mechanical Engineering Technology

Associate of Science & Bachelor of Science Programs

Suggested Course of Study
Years 1-4 Leading to the Degree of Associate of Science in Engineering Technology

FIRST YEAR

First Semester (Sept.)			Second Semester (Jan.)		
Subject No.		Credits	Subject No.		Credits
90.113	College Algebra	3	92.115	College Trigonometry	3
23.111	Engineering Drawing I	2	23.112	Engineering Drawing II	2
42.101	College Writing I	3	42.102	College Writing II	3
		<u>8</u>			<u>8</u>

SECOND YEAR

90.131	Calculus I	3	90.132	Calculus II	3
99.131	Technical Physics I	3	99.132	Technical Physics II	3
23.113	Machine Drawing	2	92.263	Fortran Programming	3
		<u>8</u>			<u>9</u>

THIRD YEAR

99.133	Technical Physics III	3	42.225	Tech. & Sci. Comm.	3
23.221	Statics	3	23.222	Dynamics	3
84.121	Chemistry I	3	23.295	Materials Science	3
		<u>9</u>			<u>9</u>

FOURTH YEAR

23.241	Elements of Thermo. I	3	23.201	Machine Tool Lab	1
23.242	Fluid Mechanics	3	23.320	Machine Design	3
23.223	Mechanics of Materials	3	23.202	Thermo/Fluids Lab	2
		<u>9</u>			<u>6</u>

Years 5-8 Leading to the Degree of Bachelor of Science in Engineering Technology.

FIFTH YEAR

First Semester (Sept.)		Second Semester (Jan.)	
Subject No.	Credits	Subject No.	Credits
17.127	Electrical Fundamentals .....3	17.128	Basic Electronics .....3
90.231	Calculus III .....3	90.232	Calculus IV .....3
.....	Area I or II <u>3</u>	23.354	Problems in MET <u>3</u>
	9		9

SIXTH YEAR

23.356	CAD/CAM .....3	47.101	General Psychology .....3
23.302	Mechanics/Materials Lab.....2	23.243	Elements of Thermo. II .....3
.....	Area II Elective <u>3</u>	.....	Human Values Elective <u>3</u>
	8		9

SEVENTH YEAR

68.201	Economics I .....3	68.202	Economics II .....3
23.475	Heat Transfer .....3	23.471	Design of Automatic Machinery.....3
.....	Free Elective <u>3</u>	.....	Free Elective <u>3</u>
	9		9

EIGHTH YEAR

20.414	Industrial Economic Mgt. ....3	23.405	Senior Project.....3
20.305	Manufacturing Processes .....3	.....	Technical Elective .....3
.....	Technical Elective <u>3</u>	.....	Area I or II Elective <u>3</u>
	9		9

All technical electives shall be chosen after conference with the Program Coordinator and MUST be approved by him.

IV Industrial Technology

Bachelor of Science in Industrial Technology Programs

1. Manufacturing Option Suggested Course of Study

FIRST YEAR

First Semester (Sept.)			Second Semester (Jan.)		
Subject No.		Credits	Subject No.		Credits
42.101	College Writing I	3	42.102	College Writing II	3
90.113	College Algebra	3	92.115	College Trigonometry	3
67.201	Accounting Principles I	3	47.101	General Psychology	3
		<u>9</u>			<u>9</u>

SECOND YEAR

20.105	Intro to Engin'g. Design	3	20.112	Machine Tool Processes	3
48.101	Intro to Sociology	3	90.132	Calculus II	3
90.131	Calculus I	3	99.131	Technical Physics I	3
		<u>9</u>			<u>9</u>

THIRD YEAR

23.221	Statics	3	68.201	Economics I	3
84.111	General Chemistry I	3	42.225	Tech. & Scientific Comm.	3
84.113	General Chemistry I Lab	1	92.383	Intro. to Statistics	3
		<u>7</u>			<u>9</u>

FOURTH YEAR

20.201	Introduction to Materials	3	20.303	Mechanical Systems	3
20.307	Fluid Power Controls	3	69.353	Organizational Behavior	3
20.310	Industrial Safety	3	20.211	Ind. Materials Lab	1
		<u>9</u>			<u>7</u>

FIFTH YEAR

First Semester (Sept.)		Second Semester (Jan.)	
Subject No.	Credits	Subject No.	Credits
27.201	Plastics Materials Science .....3	69.321	Marketing Principles .....3
20.314	Motion & Time Study .....3	20.416	Statistical Qual. Contrl .....3
20.202	Industrial Computer Science .....3	20.206	Energy Conversion Tech3
	<u>9</u>		<u>9</u>

SIXTH YEAR

20.305	Manufacturing Process .....3	69.371	Operations Management .....3
17.127	Electrical Fundamentals .....3	.....	Technical Elective .....3
17.129	Electrical Fundmntls. Lab .....1	.....	Area II Elective3
	<u>7</u>		<u>9</u>

SEVENTH YEAR

20.309	Process & Measurement Cont. ....2	20.402	Manufacturing Oper. ....3
.....	Technical Elective .....3	17.128	Basic Electronics .....3
.....	Free Elective .....3	.....	Area II Elective3
	<u>8</u>		<u>9</u>

EIGHTH YEAR

20.408	Microprocessors .....2	20.414	Industrial Eco. Mgt. ....3
.....	Technical Elective .....3	.....	Free Elective .....3
.....	Free Elective .....3	.....	Human Values Elective .....3
	<u>8</u>		<u>9</u>

Technical electives MUST be selected from one area of emphasis — Manufacturing, Safety Engineering, or Management. Approved Technical Electives for Area of emphasis follow: (may require prerequisites which automatically qualify as technical electives). Alternative areas of emphasis may be submitted by the student for approval by the Coordinator.

Manufacturing

23.222
23.404
20.203
20.427
27.202
27.401
27.303
23.471

Safety

69.481
20.429
20.430
20.431
20.432
20.433

Management

69.321
69.421
69.426
69.452
69.201
69.410
69.413
69.498

2. Water and Industrial Waste Technology Option
Suggested Course of Study

FIRST YEAR

First Semester (Sept.)		Second Semester (Jan.)	
Subject No.	Credits	Subject No.	Credits
42.101	College Writing I .....3	42.102	College Writing II .....3
90.113	College Algebra .....3	92.115	College Trigonometry .....3
67.201	Accounting Principles I .....3	.....	Free Elective3
	<u>9</u>		<u>9</u>

SECOND YEAR

90.131	Calculus I .....3	99.131	Technical Physics I .....3
84.111	General Chemistry I .....3	90.132	Calculus II .....3
84.113	General Chemistry I Lab .....1	15.246	Intro. to Hydraulics3
	<u>7</u>		<u>9</u>

THIRD YEAR

20.251	Wastewater Trt. Plant Op. I .....3	20.252	Wstwtr. Trt Plant Op II .....3
20.253	Wastewater Treatment Lab I .....1	20.254	Wastewater Treat. Lab II .....1
20.225	Water Chemistry I .....3	20.152	Water Biology3
	<u>7</u>		<u>7</u>

FOURTH YEAR

17.127	Electrical Fundamentals .....3	20.352	Water Supply & Treatment Op. II .....3
17.129	Electrical Fundamentals Lab .....1	20.452	Operation & Mntnce. of Wstwtr. Collection Sys. ....3
20.351	Water Supply & Treatment Operation I .....3	42.225	Tech. & Scientific Comm.3
	<u>7</u>		<u>9</u>

FIFTH YEAR

First Semester (Sept.)			Second Semester (Jan.)		
Subject No.		Credits	Subject No.		Credits
20.255	Water Distribution Systems	3	.....	Technical Elective	3
20.201	Introduction to Materials	3	20.105	Intro. to Eng. Design	3
23.221	Statics	<u>3</u>	20.354	Indust. Waste Treatment	<u>3</u>
		9			9

SIXTH YEAR

15.123	Surveying I	4	20.353	Water Works Oper. Lab I	1
92.383	Introduction to Statistics	3	20.257	Water/Wastewater Plant	
.....	Area II Elective	3		Management I	3
		<u>10</u>	20.416	Statistical Qual. Contrl.....	<u>3</u>
					7

SEVENTH YEAR

15.255	Environmental Eng. I	3	15.356	Environmental Eng. II	3
20.310	Industrial Safety	3	68.201	Economics I	3
69.371	Operations Management I	<u>3</u>	20.202	Ind. Computer Science	<u>3</u>
		9			9

EIGHTH YEAR

20.414	Industrial Economic Mgt	3	.....	Area I or II Elective	3
.....	Technical Elective	3	.....	Human Values Elective	3
.....	Area II Elective	<u>3</u>	47.101	General Psychology	<u>3</u>
		9			9

All Technical Electives shall be chosen after a conference with the Program Coordinator and MUST be approved by him.

3. Plastics Technology Option
Suggested Course of Study

FIRST YEAR

First Semester (Sept.)		Second Semester (Jan.)	
Subject No.	Credits	Subject No.	Credits
42.101	College Writing I .....3	42.102	College Writing II .....3
90.113	College Algebra .....3	92.115	College Trigonometry .....3
84.121	Chemistry I <u>3</u>	84.122	Chemistry II <u>3</u>
	9		9

SECOND YEAR

84.223	Princ. of Organic Chem. I .....3	42.225	Tech. & Scientific Comm. ....3
90.131	Calculus I .....3	90.132	Calculus II .....3
23.111	Engineering Drawing I <u>2</u>	84.224	Organic Chemistry II <u>3</u>
	8		9

THIRD YEAR

27.201	Plastics Matls. Science I .....3	27.202	Plast. Matls. Science II .....3
99.131	Technical Physics I .....3	99.132	Technical Physics II .....3
27.401	Processing Tech. I <u>3</u>	27.402	Processing Tech. II <u>3</u>
	9		9

FOURTH YEAR

27.406	Polymer Structures .....3	27.303	Reinf. Plastics/Comp. ....3
27.301	Additives for Polymeric Materials .....3	68.201	Economics I .....3
27.373	Plastics Mold Eng'g I <u>3</u>	.....	Area I Elective <u>3</u>
	9		9

FIFTH YEAR

First Semester (Sept.)		Second Semester (Jan.)	
Subject No.	Credits	Subject No.	Credits
92.383	Introduction to Statistics .....3	20.416	Statistical Qual. Contrl.....3
69.321	Marketing .....3	69.451	Personnel Management .....3
20.202	Industrial Computer Science <u>3</u>	.....	Area II Elective <u>3</u>
	9		9

SIXTH YEAR

20.310	Industrial Safety .....3	.....	Area I or II Elective .....3
23.221	Statistics .....3	.....	Technical Elective .....3
27.403	Physical Prop. Polymers I <u>3</u>	27.404	Phys. Prop. Polymers II..... <u>3</u>
	9		9

SEVENTH YEAR

17.127	Electrical Fundamentals .....3	69.371	Operations Management .....3
20.307	Fluid Power Control .....3	.....	Area II Elective .....3
20.309	Process & Measurement Ctl. <u>2</u>	.....	Technical Elective <u>3</u>
	8		9

EIGHTH YEAR

27.407	Plastics Ind. Organization .....3	69.452	Industrial Relations .....3
20.408	Microprocessors .....2	20.402	Manufacturing Operations .....3
.....	Human Values Elective <u>3</u>	.....	Technical Elective <u>3</u>
	8		9

Technical Electives may be chosen from business, computer, engineering technology or other technological programs.

Civil Engineering Technology

15.123 Surveying I

Class and laboratory. Principles of data gathering by surveying processes. Theories and methods of instrumental techniques for measurement of length, directions, coordinates, areas, volumes and topographic data. Introduction to and use of electronic distance measuring equipment. Problems are used to illustrate processing of field work data. Illustrative fieldwork projects to give facility in basic surveying techniques. One session per week, and five Saturdays of fieldwork, 4 credits. Prerequisites: 92.115, 23.111.

15.124 Surveying II

Class and laboratory. A continuation of 15.123. Application of basic surveying techniques of engineering problems implicit in transportation engineering, industrial and domestic housing, utilities for the safety and convenience of humans, use of land resources and the supply and control of water. Fieldwork projects typical of the applications of surveying to engineering. One session per week, and five Saturdays of field work, 4 credits. Prerequisite: 15.123.

15.237 Statics

The fundamentals of statics, including such topics as force systems, resultants, equilibrium, friction, first moments of masses and areas. One session per week, 3 credits. Prerequisites: 90.132, 99.141.

15.238 Dynamics (CE)

Laws of kinematics of particles and rigid bodies involving absolute and relative motion. Newton's law as applied to the kinetics of rigid bodies in motion. Principles of work and energy; impulse and momentum. One session per week, 3 credits. Prerequisites: 15.237; or 23.221.

15.239 Strength of Materials

Principles of strength of materials, centric, torsional and flexural loading, principal stresses. Mohr's stress cycle strain, temperature effects, shear and moment diagrams. One session per week, 3 credits. Prerequisites: 15.237; or 23.221.

15.242 Steel Design I

The selection and proportioning of structural steel members to resist axial, shearing, bending and combined stresses. The design of simple riveted, bolted and welded connections. Use of current AISC Specifications and Commentary. One session per week, 3 credits. Prerequisites: 15.251, 15.239.

15.243 Construction Materials

Class and laboratory. Properties of materials used in engineering highways and structures. Discussion of metals, timber, cement, mortars, concrete aggregates, oils, asphalts, and other building materials. One session per week, 3 credits. Prerequisite: 99.142. Corequisite: 15.239.

15.246 Introduction to Hydraulics

Properties of fluids, principles of hydrostatic pressure, fluid flow with applications to orifices, tubes, weirs, and pipes. Two demonstration laboratory sessions will be held during the semester. One session per week, 3 credits. Prerequisites: 15.238 or 23.222.

15.251 Structural Analysis I

Analysis of statically determinate structures. Reactions and stresses, framed structures, beams, trusses, graphic statics, roof trusses, truss and girder bridges, long span bridges, and lateral bracing and portals. One session per week, 3 credits. Prerequisite: 15.239.

15.253 Reinforced Concrete I

The selection and design of reinforced concrete members to resist axial, shearing, bending and combined stresses by the Working Stress Design method and the Strength method. Design of rectangular beams, T-beams, and slabs. Use of current ACI Specification and Commentary. One session per week, 3 credits. Prerequisites: 15.251; 15.239 or 23.223.

15.254 Soil Mechanics I

An elementary treatment of the physical properties of soils such as bearing and shearing strengths, soil moisture content, compressibility, consolidation, and settlement. The applications of such soil properties to typical foundations as piles, caissons, and spread footings. One session per week, 3 credits. Prerequisites: 15.243, 15.239.

15.255 Environmental Technology I

Class and laboratory. The chemistry and biology of water and wastewater including the water treatment process design and water and wastewater laboratory analyses. One session per week, 3 credits. Prerequisite: 90.131.

15.257 Highway Elements

An integral presentation of the broad field of basic highway principles covering highway administration, economics and finance, planning, design,

soils, drainage, earthwork operations, pavement, surface types, cements, and highway maintenance. One session per week, 3 credits. Prerequisite: 15.124.

15.352 Structural Analysis II

A continuation of 15.251. Deflection calculations for beams, trusses, and frames. Analyses of trusses, beams, and frames by energy methods and moment distribution. Solution of trusses and frames by the SAP IV digital computer program. One session per week, 3 credits. Offered in odd years only. Prerequisite: 15.251.

15.356 Environmental Technology II

Class and laboratory. A continuation of 15.255 with emphasis on pipe design, domestic wastewater treatment processes and their design, industrial waste treatment, and stream pollution. One session per week, 3 credits. Prerequisites: 15.255, 15.246. Offered in odd years only.

15.383 Steel Design II

A continuation of 15.242. Design of beam-columns, moment-resisting connections, built-up plate girders, and composite beam and slab sections. Consideration of basic structural members as elements within frame and floor systems. One session per week, 3 credits. Prerequisite: 15.242. Offered in odd years only.

15.391 Reinforced Concrete II

A continuation of 15.253. The analysis of and design for the behavior of the basic concrete members in structural frames and floor systems. The use of design curves and graphs as an aid to the solution of practical problems. One session per week, 3 credits. Prerequisite: 15.253. Offered in even years only.

15.392 Soil Mechanics II

A continuation of 15.254 with emphasis on application of principles. The use of field and laboratory tests in the design of foundation and the treatment of embankments. One session per week, 3 credits. Prerequisite: 15.254. Offered in odd years only.

15.394 Soil Mechanics Lab

Common soil laboratory tests including soil classification gradation, atterberg limits, strength and compressibility tests. One session per week, 1 credit. Prerequisite: 15.254. Offered in even years only.

15.463 Construction Technology

A descriptive and analytical study of methods and equipment used in the planning and execution of construction projects; the critical path method of scheduling. One session per week, 3 credits. Offered in even years only. Prerequisites: 15.243, 15.257.

15.486 Transportation Elements

A continuation of 15.257. Presentation of selected topics in the field of transportation such as traffic, integrated public transportation, planning and developmental impact of transportation routes. One session per week, 3 credits. Prerequisite: 15.257. Offered in even years only.

15.495 Civil Engineering Technology Elective

Advanced topics from the sub-disciplines of Civil Engineering Technology; that is, structures, transportation, sanitary mechanology or soil mechanics. Offered at student request and conditional on sufficient enrollment. One session per week, 3 credits. Prerequisites: Completion of the required courses in the sub-discipline in which course is offered.



Electronic Engineering Technology

17.127 Electrical Fundamentals

An introduction to the basic principles of electrical engineering, including the concept of voltage, current, resistance, inductance, and capacitance; Ohm's Law and Kirchhoff's Laws; Thevenin's and Norton's theorems; laboratory instruments. Alternating current concepts; Frequency response and filters; Diodes; Transistors and electronic amplifiers. Also included is an introduction to number systems and digital logic, both combinational and sequential circuits. Not available for EET majors. One session per week, 3 credits. Prerequisites: 92.115, 99.141.

17.128 Basic Electronics

A continuation and elaboration of the topics covered in 17.127. Topics include digital logic, both sequential and combinational circuits, operational amplifiers, power supplies, feedback and control systems, magnetics and electromechanics, AC power systems, rotating machines, and signal processing and communication systems. Not available for EET majors. One session per week, 3 credits. Prerequisite: 17.127.

17.129 Electrical Fundamentals Laboratory

An introduction to basic laboratory instruments and electronic components. Resistors, inductors, and capacitors; meters; cathode-ray oscilloscopes; power supplies, oscillators, and signal generators; bridges; and semiconductor characteristics and applications. Written reports are required. Not available for EET majors. One session per week, 1 credit. Prerequisite: 42.225. Corequisite: 17.127.

17.213 Electric Circuits

Energy, power, and charge; voltage, current, resistance, and conductance; electrical units; Kirchhoff's Laws and Ohm's Law; equivalent circuits containing resistance, and resistance and sources; network theorems; fundamentals of magnetism and magnetic circuits; meters and measuring. One session per week, 3 credits. Prerequisite: 92.263. Corequisite: 90.131.

17.214 Circuits and Laboratory I

A continuation of 17.213 Electric Circuits. Sine Waves and Phasors; Impedance and Elements; Mesh and Node Analysis of ac Circuits; Wye/Delta Conversions. The Use of Power Supplies and Measuring Instruments; Rheostats and Potentiometers; Series and Parallel Circuits; Series-Parallel Circuits; Superposition; Ammeter and Voltmeter Circuits; Ohmmeters. Written reports are required. One session per week, 2 credits. Prerequisites: 17.213, or 17.223, 42.225. Corequisite: 90.132.

17.215 Circuits and Laboratory II

A continuation of 17.214 Circuits and Laboratory I. Superposition, Thevenin and Norton Theorems applied to Sine Wave Excitations; Maximum Power Transfer; Real and Reactive Power; Resonance; Polyphase Systems. Oscilloscopes, Voltage and Current Measuring; Series Sinusoidal Circuits; Parallel Sinusoidal Circuits; Series-Parallel Sinusoidal Circuits; Series Resonance; Parallel Resonance; Transformers. Written reports are required. One session per week, 2 credits. Prerequisites: 17.214, 42.225, and 90.132.

17.216 Advanced Circuits

An extension and elaboration of the principles covered in 17.213, 17.214, and 17.215. Analysis of circuits and systems undergoing transient conditions caused by a variety of excitations, both natural and forced, utilizing the Laplace-Transform method. Application to mechanical, fluidic, thermal circuits and filters are presented as an introduction to electromechanical, electronic and control systems. One session per week, 3 credits. Prerequisite: 17.215 or 17.224.

17.237 Electronics Laboratory I

An introduction to basic laboratory instruments and electronic components. Resistors, inductors, and capacitors; meters; cathode-ray oscilloscope; power supplies, oscillators, and signal generators; bridges; and semiconductor characteristics and applications. Written reports are required. One session per week, 1 credit. Prerequisite: 17.224.

17.317 Minicomputer Programming

An introduction to fundamentals of absolute and symbolic programming. Typical digital computer organization and operation from a register-reference point of view. Computer word formats, instructions, and symbolic coding. Address modification, index register and looping. Use of system programs including the Debug, Editor, and Assembler. Subroutines, calling sequences, multiple entry, and return. Program assignments will be run on one of the University's minicomputers. One session per week, 3 credits. Prerequisite: 17.382.

17.350 Control Systems I

An introduction to linear servomechanism theory; dynamic analysis of linear systems; Laplace transform; dynamic response of physical systems, and complex plane analysis; automatic feedback control; and stability analysis. One session per week, 3 credits. Prerequisites: 17.216 or 17.225, 90.132.

17.353 Digital Electronics

An introduction to the building blocks and concepts associated with digital electronic circuits, combinational and memory devices and circuits, analog-to-digital conversion, microprocessor concepts, logic families, RTL, IIL, TTL, ECL, CMOS, read-only memories (ROMs), static and dynamic MOS random access memories (RAMs), charge-coupled device memories (CCD), programmable logic array (PLAs), multiplexers. One session per week, 3 credits. Prerequisites: 17.352 or 17.356.

17.355 Electronics and Laboratory I

Introduction to electronics signals and systems, two-part networks, amplifiers, frequency response, operational amplifier characteristics and circuits, diode characteristics and applications, rectifiers, power supplies and filtering, limiters, comparators. One session per week, 2 credits. Prerequisites: 42.225, 90.132, and 17.215 or 17.224.

17.356 Electronics and Laboratory II

A continuation of 17.355 Electronics and Laboratory I. Waveform generators, junction field-effect transistors (JFET's), graphical analysis, small-signal equivalent circuits, biasing, and multistage amplifiers. One session per week, 2 credits. Prerequisite: 17.355.

17.357 Electronics and Laboratory III

A continuation of 17.356 Electronics and Laboratory II, metal-oxide-semiconductor field-effect transistors (MOSFET's), bipolar junction transistors (BJT's), single and multi-stage amplifiers. One session per week, 2 credits. Prerequisites: 17.356, 42.225.

17.358 Electronics and Laboratory IV

Single and multi-stage amplifiers, frequency response, feedback, analog integrated circuits, filters and oscillator circuits. One session per week, 2 credits. Prerequisites: 17.357, 42.225.

17.359 Electronics Laboratory II

Experiments on solid-state devices and circuits, analog and digital, are performed with emphasis on their fundamental operation and application. Written laboratory reports are required. One session per week, 1 credit. Prerequisites: 17.237, and 17.352 or 17.362.

17.360 Electronics Laboratory III

Students are required to perform state-of-the-art experiments related to the latest solid-state devices

(both analog and digital) available. Use of the computer as a tool to solve experimental problems is encouraged. A final examination (both oral and written) and several written laboratory reports are required. One session per week, 1 credit. Prerequisites: 17.359, and 17.352 or 17.363.

17.361 Project Laboratory A

Possible projects are outlined and discussed. Students submit detailed proposals. The best feasible projects are then assigned to teams of students for implementation. Use of the computer as a tool to solve experimental problems is encouraged. One session per week, 2 credits. Prerequisites: 17.358, and 17.365.

17.365 Applied Linear Devices

The linear and non-linear applications and the characteristics of linear integrated devices will be studied. Optimal use of industry published specifications, application notes, and handbook data will be stressed. Topics include: Operational Amplifiers, Regulators, Comparators, Analog Switches, Time Function Generators, Instrumental Circuits, Logarithmic Circuits, Computing Circuits, and Signal Processing Circuits. One session per week, 3 credits. Prerequisites: 17.350. Corequisite: 17.357 or 17.364.

17.367 Digital Devices and Laboratory

An extension and elaboration of the topics covered in 17.353 Digital Electronics, 17.371 Logic Design I, and 17.372 Logic Design II. Topics include: logic devices (TTI, CMOS, ECL, and NMOS), interfacing between various logic families, propagation delay, three-state devices, totem pole and open collector structures and their uses, programmable logic devices, memory devices used as logic elements, digital timers, and clock generators. A class design project involving the above devices will be required, and approximately one-half of the course time will be an associated laboratory. One session per week, 2 credits. Prerequisites: 17.372, and 17.364 or 17.353.

17.368 Data Conversion and Laboratory

A continuation of 17.367 Digital Devices and Laboratory. The fundamentals of data conversion devices including R/2R ladder networks, weighted resistor and weighted source networks, analog-to-digital and digital-to-analog converters, voltage-to-frequency and frequency-to-voltage converters, and sample and hold circuits. Approximately one-half of the course time will be devoted to an associated laboratory. One session per week, 2 credits. Prerequisite: 17.367.

17.371 Logic Design I

A study of number systems, switching algebra and combinational logic. Topics include: number systems; coding; switching algebra; minimization and decomposition of switching functions using maps, tabular procedures and charts; basic logical gates and block diagrams; bilateral switching networks; and threshold logic. One session per week, 3 credits. Prerequisite: 17.353.

17.372 Logic Design II

An extension of the principles of Logic Design I to sequential circuits. Topics include: synchronous sequential circuits, state diagrams and tables, transition tables, state assignment, storage elements, excitation tables, partitioning, merger graphs and tables, implication graphs, asynchronous sequential circuits (fundamental and pulse mode), flow tables, races and cycles, race free assignment, and iterative networks. One session per week, 3 credits. Prerequisite: 17.371.

17.376 Electromagnetic Theory I

Review of vector analysis electrostatic theory and applications including electric field, potential, Gauss's Law, divergence, stored energy, boundary conditions, forces, dielectric materials, conductivity, electrostatic mapping, capacitance, Poisson's and Laplace's equations. Magneto-static theory, including the magnetic field, Lorentz force, motion of charged particles in combined electric and magnetic fields, Amperes Law, inductance, stored energy, boundary conditions, magnetic materials, magnetics and superconductors. Applications include two-wire transmission line, electrostatic shielding, electrostatic photography, precipitators, corona, electron emission, bubble memory devices, MHD power generation, Hall effect, magnetic shielding, and magnetic circuit design. One session per week, 3 credits. Prerequisite: 92.234.

17.380 Microprocessor Basics

An extension of topics covered in 17.353 Digital Electronics, emphasizing and based upon an integrated set of microprocessor experiments and related lectures. Topics include: hexadecimal and decimal conversion, BCD arithmetic, microprocessor programming, immediate and direct addressing, arithmetic and logic instructions, branching, index and extended addressing, subroutines, memory circuits, data input and output, introduction to PIA, digital-to-analog and analog-to-digital conversion, interfacing, and various programming projects. One session per week, 2 credits. Prerequisite: 17.353.

17.382 Engineering Problem Solutions II

The Pascal and Fortran programming techniques covered in 92.263 and 92.265, will be used extensively for the solution of problems related to electronic engineering technology. Various projects will be assigned to each student. One session per week, 3 credits. Prerequisites: 17.216, 92.234, 92.263, and 92.265.

17.391 Project Laboratory B

Students are required to submit project proposals compatible with the advanced technical electives offered. Teams are then assigned to implement selected projects. Use of the computer as a tool to solve experimental problems is encouraged. Written laboratory reports are required. One session per week, 2 credits. Prerequisites: 17.361, 17.367, and two 17.4.. E.E.T. electives.

17.392 Project Laboratory C

A continuation of laboratory projects of the type offered in 17.391 Project Laboratory B. Written reports are required. One session per week, 2 credits. Prerequisites: 17.368, and 17.391.

17.415 Pulse Techniques I

Linear wave shaping, pulse transformers, steady state switching characteristics of devices; clamping and switching circuits; and logic circuits. One session per week, 3 credits. Prerequisites: 17.353 or 17.364.

17.416 Pulse Techniques II

Bistable, monostable, and astable multivibrators; negative resistance devices; negative-resistance switching circuits; blocking oscillator circuits; time base generators; and transient switching characteristics of diodes and transistors. One session per week, 3 credits. Prerequisite: 17.415.

17.440 Electromechanics

An updated version of 17.240, to be offered as an E.E.T. elective. An introduction to magnetic circuits, transformers, alternating current machines and direct current machines. One session per week, 3 credits. Prerequisite: 17.350.

17.441 Energy Conversion

The fundamentals of the five major methods of direct energy conversion, that is, thermoelectricity, photovoltaics, thermionics, magnetohydrodynamics and fuel cells will be studied. The study will include various energy storage methods and conversion techniques. One session per week, 3 credits. Prerequisites: 17.356, 17.440.

17.459 Power Converter Design I

The design of modern switching and linear power supplies, basic voltage regulators and power converters, square-wave power converters and regulators, Compound regulating systems, thermal considerations, series-pass regulators, DC/DC converter design, switching regulators and converters. One session per week, 3 credits. Prerequisites: 17.350, and 17.365.

17.460 Power Converter Design II

An extension and elaboration of the topics covered in 17.459 Power Converter Design I. One session per week, 3 credits. Prerequisite: 17.459.

17.469 Control Systems II

A continuation of 17.350. Control loop design; real frequency and transient response; Nyquist stability criterion; compensation, optimum design; nonlinear systems; and a.c. carrier servomechanisms. One session per week, 3 credits. Prerequisite: 17.350.

17.473 Logic Design III

A continuation of 17.372, Logic Design II. Structure of sequential machines; sets, relations and lattices; state assignment using partitions; serial and parallel decomposition; decomposition with specified components; state identification and fault detection experiments; linear sequential machines; and applications of digital logic. One session per week, 3 credits. Prerequisite: 17.372.

17.477 Electromagnetic Theory II

Review of Maxwell's equations. The wave equation for free space propagation. Concept of a time varying electromagnetic field. Sinusoidal plane waves. Planewaves in dielectric and conductive media. Poynting's vector, depth and penetration, force and radiation pressure, reflection of EM waves from perfect conductors, dielectrics, and multiple dielectrics. Quarter wave and half-wave matching, polarization, Brewster's angle, and surface waves. Introductory concepts in guided electromagnetic waves including transmission lines, waveguides, and antennas from the viewpoint of Maxwell's equations. One session per week, 3 credits. Prerequisite: 17.376.

17.478 Applied Electromagnetics

The conventional two-conductor transmission line theory is presented with emphasis on those results which can be applied to the analysis and design of waveguide transmission. A discussion of the most frequently used microwave oscillators, the magnetron and klystron, are presented. The traveling

wave tube concept is emphasized. The interaction of microwave radiation with magnetic materials and practical devices of importance will be studied. Special problems encountered when microwave techniques and methods are extended to the millimeter-wavelength limit of the microwave domain, will be reviewed. One session per week, 3 credits. Prerequisite: 17.477.

17.479 Optoelectronics

This course provides a theoretical and practical introduction to optical and electronic devices used for the emission, control, propagation and detection of optical radiation, and the processing of resulting signals. A review of the physics of optical radiation and an introduction of black body radiation, photometry, and radiometry. A survey of both classical and coherent radiation sources. The laser and its technological and telecommunication applications. The detection of optical radiation from the ultra-violet to the infrared. Detector characteristics. Optical components such as lenses, mirrors, beamsplitters, and telescopes used in the transmission and reception of optical radiation; filters, polarizers, modulators, scanners required to select, shape and direct optical radiation will be discussed and their application in systems of current interest presented. One session per week, 3 credits. Prerequisite: 17.366.

17.483 Microprocessors Hardware

The immediate support chips for the 6800 and 8080 microprocessors will be examined. Hardware interfacing techniques and requirements will be investigated to include the use of RAM and PROM serial and parallel I/O ports, interrupt controllers, memory address decoding, direct memory access controllers, and interrupt timers. One session per week, 3 credits. Prerequisites: 17.371, and 17.380.

17.484 Microprocessor Software

An introduction to the architecture and instruction sets of 6800 and 8080 microprocessors. The use of internal registers, control signals and bus structures will be examined. The instruction sets will be investigated through a series of well structured programming examples which stress modular design, program initialization, parallel and interrupt driven I/O operations, and the various addressing techniques. Students will be required to develop programs that exhibit their knowledge of both the instruction sets and good programming practices. One session per week, 3 credits. Prerequisite: 17.483.

17.485 Communication Theory I

Introduction to information, transmission, and communication systems. Review of Fourier Series, and Fourier Integrals, discussion of amplitude and frequency modulation systems. An introduction to noise in electrical systems. One session per week, 3 credits. Prerequisite: 17.376.

17.486 Communication Theory II

A continuation of Communication Theory I. Pulse amplitude modulation (PAM), pulse code modulation (PCM), and pulse position modulation (PPM) systems, will be discussed and analyzed. Propagation in free space, antenna theory and propagation characteristics of the ionosphere will be presented. One session per week, 3 credits. Prerequisites: 17.485, 92.234.

17.487 Filter Design I

A review of network analysis. An introduction to synthesis, driving point impedance, approximation theory, and transfer function realization. One session per week, 3 credits. Prerequisites: 17.350, 92.234.

17.488 Filter Design II

An introduction to the analysis and synthesis of active filters. Negative resistance, controlled sources, negative impedance converters and gyrators will be discussed. Course emphasis will be on the operational amplifier as a network element. One session per week, 3 credits. Prerequisite: 17.487.

17.494 Telecommunications Engineering

Telephone channels systems objectives for human and machine interface. The switched telephone network hierarchy. Local channel performance, noise, echo, design loss and crosstalk. Frequency division multiplex systems. Time division, network design, topological considerations. Service availability, line usage and blocking. Facsimile, telex. Regulation of common carriers, tariffs. User applications include PABX system analysis. One session per week, 3 credits. Prerequisites: 17.225, 17.371.

Mechanical Engineering Technology

23.111 Engineering Drawing I

Class and laboratory. An introduction to graphical communication. Lectures and exercises on the presentation of data and shape description of mechanical solids. Topics include orthographic projection; isometric and oblique pictorials; sketching. One session per week, 2 credits.

23.112 Engineering Drawing II

Class and laboratory. Descriptive geometry of lines, points, and planes. Intersections; developments; dimensioning. One session per week, 2 credits. Prerequisite: 23.111.

23.113 Machine Drawing

Class and laboratory. Drawing of a machine from layout through details to final assembly, including drawing of cams, gears, fasteners, welding, and piping. Positional and geometric tolerancing. One session per week, 2 credits. Prerequisite: 23.112.

23.201 Machine Tool Laboratory

Modern methods of manufacturing, production, inspection, and measurements of metals and metal fabrications. One session per week, 1 credit.

23.202 Thermo/Fluids Laboratory

Fundamentals of engineering measurements, flow measurement of steam and air, tests of steam turbines and internal-combustion engines, experimental work with refrigeration units, measurements of heat transfer, combustion, fluid flow, and performance of pumps. One session per week, 2 credits. Prerequisites: 23.243, (may be taken concurrently); 23.242.

23.221 Statics

The fundamentals of statics, including such topics as force systems, resultants, equilibrium, friction, first moments of masses and areas. One session per week, 3 credits. Prerequisites: 90.131, 99.141.

23.222 Dynamics

Laws of kinematics of particles and rigid bodies involving absolute and relative motion. Newton's laws as applied to the kinetics of rigid bodies in motion. Principles of work and energy; impulse and momentum. One session per week, 3 credits. Prerequisites: 90.132, 23.221.

23.223 Mechanics of Materials I

Class and laboratory. Principles of strength of materials, centric, torsional, and flexural loading, principal stresses, Mohr's stress circle, strain, temperature effects, shear and moment diagrams. One session per week, 3 credits. Prerequisites: 90.132, 23.221.

23.320 Machine Design I

Class and laboratory. Application of theories of failure and mechanics of materials to the analysis and design of typical machine elements such as shafts, springs, screws, belts, pulleys, keys, and gears. Problems assigned also illustrate synthesis of ideas applied to design. One session per week, 3 credits. Prerequisite: 23.223.

23.241 Elements of Thermodynamics I

The thermodynamic system; heat, work; the first and second laws. Properties of vapors and gases. Perfect gas laws. The use of tables and charts. One session per week, 3 credits. Prerequisites: 90.132, 99.142.

23.242 Applied Fluid Mechanics

Properties of fluids, statics of fluids, fluid flow kinematics, momentum, energy conversion, viscosity, flow of real fluids in pipes, ducts and channels, compressible flow. Fluid couplings and torque converters. Flow measurement and fluid machinery. One session per week, 3 credits. Prerequisite: 23.222.

23.243 Elements of Thermodynamics II

The application of thermodynamic principles. Vapor and gas cycles, refrigeration, energy conversion, machinery, mixtures, availability and irreversibility. One session per week, 3 credits. Prerequisite: 23.241.

23.302 Mechanics/Materials Laboratory

Experimental study of heat treating of metals, metallography, fatigue and creep. Limitations of the formulas derived in Strength of Materials are investigated through laboratory projects. One session per week, 2 credits. Prerequisites: 23.223, 23.295, 23.222.

23.295 Materials Science

Class and laboratory. The mechanical, electrical, thermal, chemical, and magnetic properties of engineering materials and how these properties depend on crystal structure and atomic arrangement. Methods of altering the structures of materials to obtain desired properties. One session per week, 3 credits. Prerequisites: 99.142, 84.121.

23.353 Instrumentation Systems

Class and laboratory. General concepts of control-system design. Open and closed loop control systems. Laplace transforms. Transfer functions. Linear control system representation, analysis and synthesis. Performance criteria. Stability, linear feedback system design. Instruments and control devices — general characteristics, selection, and setting. One session per week, 3 credits. Prerequisite: 90.132.

23.354 Problems in Mechanical Engineering Technology

Class and laboratory. A review and extension of applied mechanics. Assigned problem in statics, dynamics, strength of materials and machine design. Introduction to digital computer programming. One session per week, 3 credits. Prerequisites: 23.222, 23.223.

23.355 Robotics

Description of current and proposed robotic systems and their applications. Structured approach to understanding the functions and interactions of robotic subsystems. Exercises in programming commercially available robots for classroom demonstrations. Methods for determining the capabilities and limitations of robotic subsystem designs through analysis and experimentation. One session per week, 3 credits. Prerequisite: 23.320.

23.356 CAD/CAM

Class and laboratory. This course deals with the creation of two and three dimensional engineering databases using an Interactive Graphics Workstation. Mechanical drawings will then be created with standard orthographic and auxiliary views. Students will be shown how to insert and modify lines, arcs, text, dimensions and other geometric entities. One session per week, 3 credits. Prerequisite: 23.113.

23.405 Senior Project

The application of the student's engineering training to a practical engineering problem. Engineering experience is gained through planning, executing, and reporting on a project approved by staff-advisor. Work may be individual or team effort, depending upon degree of complexity of project. Credit for this subject may be granted for equivalent industrial experience. Contact area coordinator for approval. One session per week, 3 credits. Prerequisite: 23.404.

23.455 Thermodynamics and Heat Transfer

An investigation of the basic laws of thermodynamics with primary emphasis on heat transfer by conduction, radiation, and convection. Also considered will be the heat transfer problems associated with microelectronics and other high density electronic packaging operations. One session per week, 3 credits. Prerequisites: 90.132, 99.142.

23.471 Design of Automatic Machinery

Class and laboratory. Basic systems approach to the design of automated machinery emphasizing selection and integration of standard components and controls. Fundamentals of pneumatic, relay and microprocessor controls applied to pneumatic, electro-mechanical and mechanical sensing and actuating components. Basics of parts handling, positioning, assembly, automatic inspection and test in small machinery systems. One session per week, 3 credits. Prerequisites: 17.128, 23.320.

23.473 Mechanics of Materials II

Various topics include shear center, unsymmetrical bending, energy methods, unit dummy load method, failure theories. One session per week, 3 credits. Prerequisites: 90.232, 23.223.

23.472 Applied Dynamics

Statics and dynamics as applied to general systems with oscillatory motion. The kinematics of periodic motion and the vibrations of systems with single degree of freedom. One session per week, 3 credits. Prerequisites: 90.232, 23.222, 23.223.

23.475 Heat Transfer

Class and laboratory. Theory and application of heat conduction in solids. Fluid flow and convection heat transfer; heat exchangers. Radiation of heat and application to problems arising in practice. One session per week, 3 credits. Prerequisites: 23.241, 23.243, 90.232.

23.486 Experimental Stress Analysis

Class and laboratory. The determination of stresses in complex structures by experimental techniques. Photoelasticity, birefringent coatings, brittle lacquer method, analogies, and mechanical and electrical resistance strain gauges. One session per week, 3 credits. Prerequisites: 90.232, 23.223.

23.478 Air-Conditioning System

A short review of thermodynamics and heat transfer, thermodynamics properties of moist air, humidity measurement, psychrometric charts, heating and cooling of moist air by extended surfaces, solar radiation calculation, heat transmission in buildings, air conditioning computation and design. Prerequisite: 23.241.

23.483 Aerodynamics

Fundamentals of subsonic aerodynamics. Atmosphere models. Airfoil data including Mach number and Reynolds number effects. Circulation, downwash, and three dimensional wing theory. Life and drag of aircraft components. Power curves, and an introduction to aircraft performance calculations. One session per week, 3 credits. Prerequisite: 23.242.

Industrial Technology

20.105 Introduction to Engineering Design

A course to introduce students to industrial practice in design graphics. Topics include graphs, orthographic projection, sectioning, limit dimensioning, gear trains, cams and fasteners. A mechanical design problem completes the semester's work. One four period session per week, (2 lecture: 2 lab) 3 credits.

20.112 Machine Tool Processes

An introduction to fundamental machine shop techniques covering machining practice, measurement and layout, and general shop safety. The objective is to develop an appreciation for basic

machine tool practices utilized in manufacturing and in industrial maintenance and repair activities; and knowledge of process and tooling specification for operations planning. Practical exposure enhances ability to communicate concepts regarding maintenance, prototype and production projects. One four period session per week, (2 lecture: 2 lab), 3 credits. Prerequisite: 20.105 or equivalent. NOTE: replaces 23.201.

20.152 Water Biology

An introduction to the biology of natural waters. Topics include freshwater animals, plants, community relationships, population dynamics, effect

of pollution, water borne disease. Includes some lab and field work. One session per week, 3 credits.

20.201 Introduction to Materials

A practical study of the relationship between properties, composition and structure of metals, ceramics and composites. This course includes selection, crystal structure, alloy phase diagrams, solidification and heat treating principles of metals as well as their application in normal and extreme environmental conditions. Laboratory (20.211) investigations reinforce lecture material, but emphasize testing procedures for materials. One session per week, 3 credits. Prerequisite: 84.111.

20.202 Industrial Computer Science

An introduction to the use of computers in industry by programming COBOL and Fortran languages. Ten programs are required to be designed and run by the students. Problems include I/O, min-max, branching, arrays, matrices, plotting, subprograms, and major inventory type problem. One session per week, 3 credits. NOTE: This may be taken in lieu of both Basic (or COBOL) and Fortran requirements of earlier programs. A technical elective will then be required to make up difference in credits.

20.206 Energy Conversion Technology

The principles of thermodynamics and its application. The basic of heat transfer and psychrometric properties. Heating ventilating, air conditioning and controls. A term project is required. One session per week, 3 credits. Prerequisite: 99.141 or equivalent.

20.211 Industrial Technology Laboratory

Laboratory studies designed to accompany Introduction to Materials and Advanced Materials. One session per week, 1 credit. Prerequisites or corequisites: 20.201, 20.208.

20.225 Water Chemistry I

This course covers basic chemical theory. Reactions and equations will be presented along with an introduction to the structure and character of water, its impurities and the chemical treatment schemes that have been devised to deal with them. One session per week, 3 credits.

20.226 Water Chemistry II

A continuation of 20.225, it covers specific water and wastewater treatment practices such as chlorination, coagulation, filtration, and absorption,

with a focus on analytical techniques for the particular parameters of interest. Wet chemistry as well as instrument methods will be discussed and demonstrated during lab sessions that compliment the lecture material. One session per week, 3 credits. Prerequisite: 20.225.

20.251 Wastewater Treatment Plant Operations I

This course is geared to the assumption that students are not familiar with plant operations. Lectures begin on preliminary treatment and proceed through primary and various types of secondary treatment with emphasis on activated sludge, chlorination, and sludge dewatering and ultimate disposal. The primary emphasis is on the conventional activated sludge process. One session per week, 3 credits.

20.252 Wastewater Treatment Plant Operations II

This course is available for those who have taken 20.251, or for plant operators experienced in biological treatment. Control of the activated sludge process is emphasized, based upon solids balancing, using the centrifuge and settleometer. This technique has been developed by Al West of EPA. In addition, industrial wastes and advanced wastewater treatment are covered, including the removal of phosphates and nitrates. One session per week, 3 credits. Prerequisite: 20.251.

20.253 Wastewater Treatment Lab I

An introductory course teaching the basic laboratory techniques and procedures used to operate and monitor conventional wastewater treatment facilities. Included are solids, chlorine residual, pH, BOD, total coliform, alkalinity, acidity, sludge, and microscope analysis. One session per week, 1 credit. Corequisite: 20.251.

20.254 Wastewater Treatment Lab II

An advanced course designed to teach the lab techniques and procedures used to operate and monitor advanced wastewater treatment facilities. Included are "West" method, nitrification, phosphorous, jar test, COD, BOD, TOC, total coliform, turbidity, and chloride analysis. One session per week, 1 credit. Prerequisites: 20.251, 20.253.

20.255 Water Distribution Systems

This course is an introduction to the principles, materials and practices in the operation and maintenance of drinking water distribution systems, including the following topics: system hydraulics,

pumping, mains, services, valves, hydrants, metering, flushing, storage, fire control, leak control, cross connection prevention, disinfection, etc. One session per week, 3 credits.

20.257 Water/Wastewater Plant Management I

An introduction to the principles of management with emphasis on topics related to the operation of water and wastewater treatment plants. The following subjects will be discussed: staffing, labor relations, public relations, financing, budgeting, legislation, and management principles. One session per week, 3 credits.

20.258 Water/Wastewater Plant Management II

A continuation of 20.257, Water/Wastewater Plant Management I, with an emphasis on supervisory management for water and wastewater personnel. Rate studies, user services, labor relations, and numerous case studies will be utilized. One session per week, 3 credits. Prerequisite: 20.257.

20.303 Mechanical Systems

An introduction to the design or selection of mechanical elements used in the transmission of power in industrial equipment. Elements considered include shafts, pulleys, gears, and gear trains, bearings, clutches, brakes and springs. One four hour session per week (2 lecture: 2 lab), 3 credits. Prerequisite: 23.221 or equivalent.

20.305 Manufacturing Processes

Course work entails introduction to nonconventional machining such as Electrical Discharge Machining, and the various forms of chemical machining; automatic manufacturing concepts from electromechanical operations to the fundamentals of numerical control manufacturing; forming, casting, fastening and assembly techniques are also covered. The objective is to develop a broader understanding of manufacturing operations and product design/manufacturing relationships. Laboratory experience includes non-conventional machining, numerical control operations and programming. One four period session per week, (2 lecture: 2 lab), 3 credits. Prerequisites: 20.105, 20.107, 23.201.

20.307 Fluid Power Controls

Laboratory experiences and lectures on the elements of hydraulic and pneumatic power systems, and the automatic control of these systems. Systems elements studied are actuators, valves, power sources and accessories. Control systems studied

are pneumatic, electronic and fluidic logic. Electrical solenoid and relay control circuits are designed. One four hour session per week, (2 lecture: 2 lab), 3 credits.

20.309 Process Measurement and Control

An introduction to process control system technology. Liquid level, rate of flow, pressure and temperature measuring devices and their characteristics. R-C of system components. Integral, dead-time and first order lag processes. Control modes. Bode diagrams and frequency response. One three hour session per week, (1 lecture: 2 lab), 2 credits. Prerequisite: 17.127.

20.310 Industrial Safety

A practical study of industrial safety and accident prevention. Studies include hazard analysis, safety management, engineering remedies and risk management. Numerous practical cases are presented and the roles of governmental agencies in safety are analyzed. One session per week, 3 credits.

20.314 Motion and Time Study

Methods improvement and work measurement techniques, including principles of motion economy, work simplification, process and operator charts, work sampling and time standards. One session per week, 3 credits.

20.351 Water Supply and Treatment Operations I — Basic

An introduction to the principles and practices of operation and maintenance of drinking water supplies and treatment plants. The following topics will be covered using case studies: sources of supply, well and reservoir operation, contaminants and regulation, hazardous materials, overview of treatment, chemical feeding, coagulation, settling, operating conditions, filtration, solids handling, disinfection, chlorination, fluoridation. One session per week, 3 credits.

20.352 Water Supply and Treatment Operations II — Advanced

A continuation of 20.351, Water Supply and Treatment Operations I, covering the following topics: corrosion control, oxidation and aeration, use of ozone, chlorine dioxide and potassium permanganate, iron and manganese carbon, softening, instrumentation and control, system contamination control, reverse osmosis, ultrafiltration, electrodialysis, distillation and UV, energy management. One session per week, 3 credits. Prerequisite: 20.351.

20.353 Water Works Operations Lab I

This laboratory course will introduce the student to fundamental laboratory equipment as it applies to the operation of water treatment facilities. The following determinations will be conducted: odor, test, color, turbidity, jar tests, pH, chlorine residual, acidity, alkalinity, hardness, chlorides, iron, manganese, phosphate, aluminum, nitrogen cycle, coliform, microscopic analysis, heavy metals and organics. One session per week, 1 credit.

20.354 Industrial Waste Treatment

An introductory approach to the operation and control of the major types of industrial waste treatment processes. The industrial waste treatments to be discussed include the following industries: textile, food processing, paper, metal finishing, and tanneries. This course will include basic lab work to include pH, alkalinity, acidity, chlorine residual, and solids. One session per week, 3 credits.

20.355 Water Works Operations Lab II

This course presents a continuation from the material in 20.353. The following determinations will be conducted: fluoride, fecal coliform, phosphate, algae and microscopic analyses, filterability, TKN, TOC, heavy metals with AA apparatus, activated carbon assessment, and laboratory quality assurance. One session per week, 1 credit. Prerequisite: 20.353.

20.402 Manufacturing Operations

This course is organized so that students can design the manufacturing process and fabricate a product for small quantity production. Accompanying lectures cover pertinent subject areas such as: forecasting, plant layout, materials handling, pert/cost, product evaluation and equipment selection. One session per week, 3 credits. Prerequisite: 17.127.

20.408 Microprocessors

A continuation of Process Measurement and Controls with emphasis on the use of microprocessors in programmable controllers. A laboratory supplements the theory. One three hour session per week, (1 lecture: 2 lab), 2 credits. Prerequisite: 20.309.

20.414 Industrial Economic Management

Analysis of available alternatives in equipment, plant and materials purchasing or leasing. Economic feasibility analysis of industrial projects including depreciation techniques, break-even

analysis, benefit-cost techniques, replacement, present worth and rate of return analysis. One session per week, 3 credits.

20.416 Statistical Quality Control

A study of the statistical and administrative techniques relative to the maintenance of product quality at defined levels. Sampling plans for variables and attributes are considered from the viewpoint of consumer-vendor relationships and economics. One session per week, 3 credits. Prerequisite: 92.383.

20.423 Product Liability

Product liability has become of increasing importance to industrial engineers due to legal decisions involving direct placement of liability for safe products on original manufacturers, and on individual responsible engineers. In this course, the legal aspects of negligence, strict and implied liability will be developed and the role of engineers in designing, manufacturing and testing reasonable, safe products will be defined. The role of government agencies such as the Consumer Product Safety Commission and reference sources for product liability literature will be examined. Numerous product liability cases will be reviewed with specific examples of investigative techniques utilized to prove liability for failure. One session per week, 3 credits.

20.427 Plant Lay-Out and Materials Handling

A study of materials flow, layout production, assembly and service departments, manufacturing, buildings, service facilities, handling equipment, and packaging techniques. One session per week, 3 credits. Prerequisites: 20.105, 20.107.

20.429 Occupational Safety and Health Regulations, and Regulatory Agencies

An introduction to the general concepts of safety and health. Topics include historical developments, program concepts, social, legislative and regulatory requirements and basics of hazard recognition, evaluation and control. The role of governmental agencies, such as OSHA, EPA, and NIOSH, in safety will be explored. In addition to course credits, a certificate will be issued from OSHA upon completion. One session per week, 3 credits.

20.430 Industrial Hygiene and Toxicology

An introduction to the principles of industrial hygiene and toxicology. Topics include elements of toxicology and occupational disease, airborne

contaminants, ionizing and non-ionizing radiation, noise and vibration, and heat stress. Emphasis on understanding biological response to and measurement of environmental hazards. Application of non-engineering controls with some introduction to the concepts of engineering controls. One session per week, 3 credits. Prerequisite: 20.429.

20.431 Safety Management

Application of management principles to loss control programs. Topics include organization of the safety function, program evaluation techniques, budgeting for the safety function, evaluation of training and education programs, emergency planning, relationships with line and staff functions, the legal environment of safety and health, and loss control accountability. One session per week, 3 credits. Prerequisites: 69.371, 20.429.

20.432 Fire Prevention and Protection

Introduction to fire prevention and protection. Study of the behavior of fire, fire hazards of materials, fire safety in facilities and equipment of design, design of fire protection systems and detection systems, process fire hazards, transportation fire hazards, and fire codes. One session per week, 3 credits. Prerequisites: 20.310, 20.429.

20.433 Human Factors in Engineering Design

An examination of the variables that influence the human operator in man-machine-environment systems. Topics include the nature of man-machine systems, the capabilities and limitations of humans and machines, simulation for design and training, principles of symbolic and pictorial displays, static and dynamic forces on the human frame, response to environmental stress, and vigilance and fatigue. One session per week, 3 credits. Prerequisites: 47.101, 23.221, 92.383.

20.452 Operation and Maintenance of Wastewater Collection Systems I

This course will examine the proper operation and maintenance of wastewater collection systems. Inspection, testing, installation, and repairs of the collection system will be covered. Health hazards encountered in this work will be addressed and safety will be emphasized. Pumping station operation and maintenance will be covered in detail. Confined space entry and working in hazardous environments is covered. One session per week, 3 credits.

20.453 Operation and Maintenance of Wastewater Collection Systems II

Locating and evaluating problems such as sewer blocks, leaks, odors, breaks and lift station failures. The selection of procedures and equipment to minimize the reoccurrence of these problems will be addressed. Cost effectiveness of purchasing versus leasing construction equipment for major work will be discussed. Organization, administration and union involvement in the field will be covered. State-of-the-art construction and design will be covered with a field trip to a modern pumping facility. One session per week, 3 credits.

20.455 Solid Waste Management

An introduction to the principles and practices of solid waste management with emphasis on the sources and characteristics of present day solid wastes; current collection methods, systems and equipment; available disposal techniques and facilities; public health, economic and environmental issues; future trends in the solid waste industry. One session per week, 3 credits.

20.457 Advanced Water and Wastewater Laboratory

Includes some of the most modern instrumental techniques for water and wastewater analysis including A.A., TOC, and gas chromatography. Also includes laboratory quality control with special emphasis on laboratory certification. One session per week, 1 credit. Prerequisites: 20.253, 20.254.



Plastics

27.201 Plastics Materials Science I

Class and laboratory. The history, classification, definitions, raw materials, methods of manufacture, properties and uses of polymeric materials with emphasis on the engineering plastics. Laboratory sessions and demonstrations as scheduled by the instructor. One session per week, 3 credits.

27.202 Plastics Materials Science II

Class and laboratory. A continuation of 27.201 with special emphasis on fillers and reinforcements, modifiers, additives and other ingredients that go into making typical plastics molding compounds. Introduction to laminates and reinforced plastics, film and sheeting, as well as adhesives, and miscellaneous resins are surveyed. Laboratory sessions and demonstrations as scheduled by the instructor. One session per week, 3 credits. Prerequisite: 27.201.

27.301 Additives for Polymeric Materials

Analysis of additives including stabilizers, plasticizers, fillers and reinforcements, biocides, flame retardants, antistatics agents, and release agents. Special emphasis on the characteristics of each type of additive, compatibility interactions, and effects on processing. Review of the most current methods of testing efficiency of each additive system. One session per week, 3 credits.

27.303 Reinforced Plastics Composites

Review of composites as a class of materials and the mechanical physical characteristics. Fundamental concepts underlying these properties with particular emphasis on fibrous reinforced plastics. Survey of matrices, reinforcements, and methods of fabrication. One session per week, 3 credits. Prerequisite: 27.202.

27.373 Plastics Mold Engineering I

Class and laboratory. Introduction to the principles of basic mold and die design and construction. Laboratory design of molds and/or dies to be constructed in continuing portions of this course. Lecture, laboratory and demonstrations at the discretion of the instructor. One session per week, 3 credits. Prerequisite: 27.401.

27.376 Mold Engineering II

(Continuation of 27.373, which is a prerequisite.) One session per week, 3 credits.

27.401 Processing Technology I

Class and laboratory. Theory and methods of processing plastics materials including compound-

ing, molding, extruding and thermoforming. Evaluation and development of typical problems. Laboratory sessions and demonstrations as scheduled by the instructor. One session per week, 3 credits. Prerequisite: 27.202.

27.402 Processing Technology II

Class and laboratory. A continuation of 27.401, which touches extensively upon casting, laminating, fabricating, and finishing. Correlation of composition, processing and fabricating with product design and applications is also covered. Laboratory sessions and demonstrations as scheduled by the instructor. One session per week, 3 credits. Prerequisite: 27.401.

27.403 Physical Properties of Polymers I

Introduction to basic mechanical properties of polymers as linear viscoelastic materials. Concepts of creep, stress relaxation, and superposition principles emphasized. Dynamic mechanical behavior, interrelations between various properties, electrical behavior, miscellaneous mechanical properties, optical properties. One session per week, 3 credits. Prerequisite: senior status.

27.404 Physical Properties of Polymers II

A continuation of 27.403. One session per week, 3 credits.

27.405 Polymer Characterization

Instrumental methods of characterizing plastics materials. The theory and interpretation of infrared spectroscopy, gas chromatography, gel permeation chromatography, differential thermal analysis, thermal gravimetric analysis, osmometry, etc. The determinations will include elucidation of structure, identification, molecular weight, molecular weight distribution and glass transition temperatures. One session per week, 3 credits. Prerequisite: 84.122, permission of coordinator.

27.406 Polymer Structure

The fundamental relationship between molecular structure, properties and end-use applications of plastics materials will be explored in detail. Molecular structural features include chemical composition, molecular size and flexibility, intermolecular order and binding, and supermolecular structure. Properties include processability, mechanical, acoustic, thermal, electrical, optical and chemical properties, price, and balance of properties. Applications include rigid solids, flexible solids, foams, film, and non-plastic applications. Prerequisite: permission of coordinator. One session per week, 3 credits.

27.407 Plastics Industry Organization

Economics of producing plastics raw materials and converting them into end products, from research and development to plant construction, operation and marketing. Market analysis of plastics production, processing, and consumer patterns; commercial development, sales, and technical service. Organization of the plastics industry for research and development, specialty and commodity production, profit and growth. Prerequisite: permission of coordinator. One session per week, 3 credits.

27.451 Selected Topics in Polymers I

Specialized topics in applied polymer science, adhesives, elastomers, coatings, and fibers as well as other timely subjects. One session per week, 3 credits. Prerequisite: permission of coordinator.

27.452 Selected Topics in Polymers II

(Continuation of 27.451, which is a prerequisite, also permission of coordinator.) One session per week, 3 credits.

College of Health Professions

Eleanor Shalhoup, Dean; R.N., B.S., M.S., CAGS, Ed.D.

Susan Wiszenski, Assistant Dean; B.A., J.D.

Norma McQuaid, Nursing Coordinator; R.N., B.S., M.S.

The College of Health Professions offers registered nurses an opportunity to pursue baccalaureate studies by initiating undergraduate work through Continuing Education.

Matriculation and Retention in the Nursing program

Only Registered Nurses are eligible for admission into the nursing program. Nursing students must satisfactorily complete all courses which are specified by the nursing program for the first seven semesters. They also must achieve a cumulative grade point average of 2.5 or better for all courses and a cumulative grade point average of 2.5 or better in the required sciences in order to be eligible to register for the professional nursing courses. To qualify for continued matriculation in the nursing program, the R.N. students must maintain on-going cumulative averages of 2.50 or better at the end of each semester, a semester average of 2.50 or better, not less than a grade of "C" in any professional major course, and a semester average of 2.50 or better for professional courses attempted in the major. Students who fail to satisfy these requirements will be dropped from the program. Such students may seek reinstatement to the nursing program by filing a petition with the Professional Review Committee of the Department of Nursing.

The following courses are not allowed for credit towards degree:

- 30.101 Intro to Health Professions
- 30.103 Life & Health
- 30.301 Contemporary Health Problems
- 31.304 Drug, Alcohol & Smoking Education
- 83.123 Nutrition & Disease
- 83.126 Human Disease & Immunity
- 83.214 Human Ecology

The registered nurse student must pass departmental equivalency examinations which include a clinical component for a total of twenty four credits with a BC or better in order to continue to the fifth year of the evening program. Questions regarding the nursing program should be directed to the Program Coordinator.

All students in the Nursing Program must demonstrate a state of emotional and physical health which will enable them to provide safe, competent practice in nursing. In special cases, at the request of the Professional Review Committee, an individual may be required to present statements of physical or mental health from appropriate physicians or psychiatrists who are fully licensed by the Commonwealth of Massachusetts.

On the basis of a review of such statements, the Professional Review Committee may recommend to the chairperson of the Nursing Department that the individual be denied admission to the Nursing Program, or that his or her enrollment in this program be terminated.

Each registered nurse student must provide proof of:

1. Current certification as a Basic Cardiac Life Support Provider;
2. Professional liability insurance in the amount of one million/one million aggregate in order to participate in the clinical courses of the nursing curriculum;
3. Evidence of a tuberculosis skin test or X-ray report; and
4. A report of a complete physical examination and a current Rubella immunization.

Proof that requirements 1-4 above have been met must be submitted to the Continuing Education Coordinator of the Nursing Program by September **first** of **each** year.

Nursing

Recommended Course of Study
Leading to Evaluation for Continuation in Bachelor of Science Degree Program

FIRST YEAR

First Semester (Sept.)			Second Semester (Jan.)		
Subject No.		Credits	Subject No.		Credits
42.101	College Writing I	3	42.102	College Writing II	3
84.111	General Chemistry I	3	84.112	General Chemistry II	3
84.113	General Chemistry Lab I	<u>1</u>	84.114	General Chemistry Lab II	<u>1</u>
		7			7

SECOND YEAR

35.201	Human Anat. & Phys. I	3	35.202	Human Anat. & Phys. II	3
35.203	Human Anat. & Phys. Lab I	1	35.204	Human A. & P. Lab II	1
47.101	General Psychology	<u>3</u>	48.101	Intro. to Sociology	<u>3</u>
		7			7

THIRD YEAR

92.383	Introduction to Statistics	3	47.163	The Human Life Span	3
47.232	Psychology of Personality	3	47.328	Dynamics of Interpersonal Relations	3
45.202	Introduction to Logic	<u>3</u>	.....	Area II Elective	<u>3</u>
		9			9

FOURTH YEAR

30.201	Community Health	3	*33.201	Concepts of Professional Nursing Practice	6
35.211	Basic Clinical Microbiology & Pathology	3	33.202	Pathophysiology	3
35.213	Basic Clinical Microbiology & Pathology Lab	<u>1</u>	.....	Area I* or II Elective	3
		7		*May not be from psychology dept.:	<u>47.</u>
					12

All students planning to enter this program **MUST** make an appointment with the Program Coordinator before taking any classes.

*Eligible students **MUST** obtain the **signed permission** of the Program Coordinator before registering for any course with a prefix of 33.

Recommended Course of Study
Leading to Students Admitted to Bachelor of Science Degree Program

FIFTH YEAR

First Semester (Sept.)		Second Semester (Jan.)	
Subject No.	Credits	Subject No.	Credits
33.401	Nursing Care of Clients In Crisis .....6	33.401	Nursing Care of Clients in Crisis.....6
.....	Elective..... <u>3</u>	.....	Elective..... <u>3</u>
	9		9

SIXTH YEAR

33.402	Issues and Trends in Nursing .....2	33.404	Comp. Nursing Practice .....6
33.403	Leadership-Nursing Practice .....5	.....	Elective (300-400 level) <u>3</u>
.....	Elective (300-400 level) <u>3</u>		9
	10		

NOTE: If there is sufficient student interest, the sixth year will also be offered as a ten week summer day session.
The clinical component of 33.401, spring semester is a day experience. Junior Year Nursing Challenge Examinations are given during the day and are scheduled over a one month period.
Students must pass course equivalency examinations in Day School Junior Subjects and their clinical components in order to be admitted to the fifth year of the Evening Program. Students should consult the Program Coordinator.

Clinical Laboratory Sciences

35.201 Human Anatomy & Physiology I

Human Anatomy & Physiology is a two-semester sequence which covers the basic structure and function of the human body. First semester topics include the Basic Body Plan; Cell Anatomy; Cell Physiology; The Integumentary System; The Skeletal System, The Muscular System; The Nervous System; Endocrinology and The Special Sensory System. One session per week, 3 credits. Prerequisite: 1 semester of chemistry. Corequisite: 35.203.

35.202 Human Anatomy & Physiology II

Human Anatomy & Physiology II is a continuation of the study of the human organism relating structure and function. Among the systems covered will be The Circulatory, Respiratory, Digestive, Excretory, and Reproductive Systems of man. One session per week, 3 credits. Prerequisite: 35.201. Corequisite: 35.204.

35.203 Human Anatomy & Physiology Lab I

The laboratories are designed to reinforce material covered in lecture by practical exposure to the subject matter. Another outcome will be the understanding of the practical application of basic laboratory techniques and methodology. One session per week, 1 credit. Corequisite: 35.201.

35.204 Human Anatomy & Physiology Lab II

Each laboratory session is designed to reinforce the didactic material with practical exposure to the structural and functional aspects of the human body. One session per week, 1 credit. Corequisite: 35.202.

35.211 Basic Clinical Microbiology and Pathology

This course is designed to study the fundamentals of microbiology with major emphasis on the structure and function, growth and metabolism and classification of clinically important microorganisms; the origin and mechanism by which microorganisms produce disease; the human body's response to invading microbes; an introduction to the ecological aspects of microorganisms in the environment with particular stress on their significance, activities (beneficial and detrimental) and control measures. One session per week, 3 credits. Prerequisites: 35.103, 35.104. Corequisite: 35.213.

35.213 Basic Clinical Microbiology and Pathology Laboratory

Laboratory investigations of basic properties and characteristics of microorganisms; the student will perform commonly used techniques for collecting, handling and studying clinically important microorganisms. One session per week, 3 hours, 1 credit. Prerequisites: 35.103, 35.104. Corequisite: 35.211.

Nursing

30.201 Community Health

This course emphasizes the concepts, philosophy and principles of public health and the relationship to the physical, mental and social well-being of the community, its individuals, families and groups. The focus is on the prevention of disease, the promotion and maintenance of health and provision of environmental and personal health services through organized community effort. One session per week, 3 credits.

33.201 Concepts of Professional Nursing Practice

This course introduces the student to concepts utilized in the practice of nursing. Consideration is given to the process of adaptation with primary focus on students adapting to the nursing role. Utilization of the nursing process is viewed as the scientific method of nursing and nurse patient interaction. Health assessment skills are taught and practiced in laboratory setting. Basic nursing perceptual-motor skills are learned in a self-paced autotutorial laboratory setting. Clinical practice sessions are incorporated in the latter part of the course. Prerequisite: First 3 semesters of nursing curriculum. Corequisite: 33.202, 6 credits.

33.202 Pathophysiology

This course is designed to present a conceptual approach to human pathophysiology. Content focuses on the basic mechanisms of disease processes and the resulting alterations in body function. Selected major health problems are studied as representative concepts of sensory deprivation, autoimmune response, fluid and electrolyte imbalance, oxygen deprivation, abnormal cell proliferation, chemical deregulation, interference with nutrition with neural dysfunction. Corequisite: 33.201. One session per week, 3 credits.

33.401 Nursing Care of Clients in Crisis

Building upon previous knowledge of developmental and situational stresses, crisis is viewed from a theoretical perspective. The dynamics of crisis situations as they involve individuals, families and the community are analyzed. Clinical practice is planned to give students the opportunity to relate their experiences to appropriate theoretical models and to carry out therapeutic interventions appropriate to the care of clients at risk, to or experiencing crisis. Prerequisite: 33.305. 12 credits (6 each semester).

33.402 Issues and Trends in Nursing

This course focuses on significant issues and trends resulting from societal developments. The impact of these issues and trends on professional nursing and health care is examined. Prerequisite: 33.401. Corequisite: 33.403. 2 credits.

33.403 Leadership in Nursing Practice

The student's potential for directing, guiding and influencing others is developed in selected group experiences. Knowledge gained from theory, research, and experience is investigated and analyzed critically. The data are applied to the health care management of clients and families through the use of the nursing process, stressing client advocacy and interdisciplinary cooperation. The student will examine his own philosophy, learning needs, and growth, preparatory to becoming a more fully self-directed professional nurse. Prerequisite: 33.401. Corequisite: 33.402. 5 credits.

33.404 Comprehensive Nursing Practice

This clinical course focuses on the transition to the professional nursing role. Planned clinical experiences are provided so that nursing skills can be refined and role behaviors and values internalized. Weekly conferences provide opportunities to share experiences and to evaluate progress in meeting objectives. 6 credits.

College of Liberal Arts

Patricia A. Goler, Dean; A.B., A.M., Ph.D., L.L.D., D.H.L.
Richard L. Derry, Assistant Dean; A.B., A.M.
Donald R. Berry, Liberal Arts Coordinator; A.B., M.A.
Eva Buzawa, Criminal Justice Coordinator; B.A., M.S., Ph.D.

The College of Liberal Arts offers the following undergraduate programs through the Evening School: Associate of Science (Public Service: Administration of Criminal Justice), Bachelor of Science (Public Service: Administration of Criminal Justice), and Bachelor of Liberal Arts (single concentration option).

I Associate of Science

Public Service: (Administration of Criminal Justice) – 61 Credits

General University Requirements	34 credits
Criminal Justice Requirements	18 credits (asterisked)
Free Electives (with permission of coordinator)	9 credits

II Bachelor of Science

Public Service (Administration of Criminal Justice) – 121 Credits
(Enforcement, Corrections, or Law and the Courts Tracks)

General University Requirements	34 credits
42.101 College Writing I	3 credits
42.102 College Writing II	3 credits
Area I (Must include 47.101 General Psychology and 48.101 Introduction to Sociology)	9 credits
Area II	9 credits
Area III (Must include 90.112 and 90.119, College Algebra for Management I and II, plus one science/laboratory course.)	10 credits
Criminal Justice Requirements	36 credits

There are three main areas or tracks which a student may elect: Enforcement, Corrections, or Law and the Courts. Courses suggested for one track are not exclusive, however, and some crossover is desirable.

ENFORCEMENT

- *+44.101: The Criminal Justice System
- *+46.230: Law & the Legal System
- *44.141: Police Functions
- *+44.221: Criminology I
- 44.234: Criminal Law
- *44.243: Criminalistics I
- 44.244: Criminalistics II
- *44.261: Juvenile Delinquency
- 44.341: Comparative Police Systems
- 44.371: Criminal Justice Management and Planning
- 44.373: Issues in Police Administration
- +44.390: Research Methods in Criminal Justice
- +44.490: Research Seminar in Criminal Justice
- +44.496: Practicum (In-service students will substitute 44.370 or 44.371)

LAW AND THE COURTS

- +44.101: The Criminal Justice System
- +46.230: Law & the Legal System
- +44.221: Criminology I
- 44.234: Criminal Law
- 44.261: Juvenile Delinquency
- 44.321: Criminology II
- 44.331: Penal Law
- 44.335: Juvenile Court Philosophy and Practice
- 44.354: Probation and Parole
- 44.360: Minorities and the Criminal Justice System
- 44.371: Criminal Justice Management and Planning
- 44.380: Selected Issues
- +44.390: Research Methods in Criminal Justice
- +44.490: Research Seminar in Criminal Justice
- +44.496: Practicum (In-service students will substitute 44.370 or 44.371)

- *Associate Degree Required Courses
- +Bachelor Degree Required Courses

CORRECTIONS

- *+44.101: The Criminal Justice System
- *+46.230: Law & the Legal System
- *44.151: Introduction to Corrections
- *+44.221: Criminology I
- *44.234: Criminal Law
- *44.261: Juvenile Delinquency
- 44.331: Penal Law
- 44.351: Alternatives to Corrections
- 44.354: Probation and Parole
- 44.371: Criminal Justice Management and Planning
- 44.372: Issues in Correctional Administration
- +44.390: Research Methods in Criminal Justice
- +44.490: Research Seminar in Criminal Justice
- +44.496: Practicum (In-service students will substitute 44.370 or 44.371)

- *Associate Degree Required Courses
- +Bachelor Degree Required Courses

Additional Requirements	51 credits
Cross-Discipline Courses (4 courses selected from the following list)	12 credits
43.308 History of Crime, Conflict and Social Control in the U.S.	
43.309 English, Constitutional, and Legal History	
46.260 Public Administration	
46.345 Constitutional Law and Politics	
46.374 Civil Liberties, Law and Politics	
46.356 Public Policy Analysis	
47.365 Psychology of Crime and Corrections	
48.361 Sociology of Law and the Criminal Justice System	
Free Electives Selected with permission of coordinator.	27 credits

Professional Skills12 credits

Professional skills requirements can be satisfied in either one of the following areas:

- I Foreign Language (Intermediate level proficiency required)
- II Computer Sciences (The following sequence of 12 semester hours is required):

- 92.209 Introduction to Basic
- 92.383 Introduction to Statistics
- 92.363 Introduction to Data Analysis (S.P.S.S.)

and one of the following:

- 92.263 Fortran
- 92.265 Pascal
- 92.365 Cobol

Suggested Course of Study for First Two Years

FIRST YEAR

First Semester (Sept.)			Second Semester (Jan.)		
Subject No.		Credits	Subject No.		Credits
44.101	The Criminal Justice System	3	44.221	Criminology I	3
42.101	College Writing I	3	42.102	College Writing II	3
48.101	Introduction to Sociology	3	47.101	General Psychology	3
		9			9

SECOND YEAR

46.230	Law & the Legal System	3	44.261	Juvenile Delinquency	3
90.112	College Algebra for Management I ...	3	90.119	College Algebra for Management II ...	3
.....	Area I or II Elective	3	.....	Area I or II Elective	3
		9			9

III

Bachelor of Liberal Arts (Concentration in Social Sciences) 120 Credits

General University Requirements	34 credits
English Composition	6 cr.
Area Distribution (see University Requirements for Baccalaureate Studies)	27-29 cr.
Major Concentration	36-60 cr.
Optional Minor	18-24 cr.
Elective Courses	Remaining cr.

Major Concentration

Presently, a student may select a concentration in Social Sciences. Other concentrations may be offered at a later date.

Students must maintain a 2.20 cumulative average in the area of concentration and must select at least 15 credit hours in 300 level courses or higher.

Students selecting Psychology or Sociology as their concentration must take a 400 level seminar which has as its prerequisites the six courses (18 credits) previously taken in concentration.

Minor (Optional)

A student may select a minor (18 to 24 credits) in one of the following areas:

- Humanities
- Economics
- Computer Science
- Mathematics (no course less than Calculus I with 6 credits in 300 level courses or higher.)

Electives

Electives may be chosen from Economics, Chemistry, Science, Mathematics, Computer Science, Clinical Laboratory Science, Behavioral and Social Science, Fine Arts and Humanities. In addition, the following courses also may be taken: Accounting (67.201, 67.202, 67.301, 67.302); and Management (69.201, 69.321, 69.332, 69.353)



Behavioral and Social Sciences

(See Area Distribution Requirements, p. 14)

Criminal Justice

44.101 The Criminal Justice System

This course includes a brief history of the Criminal Justice System and an analysis of its structure and function. Required for all majors and prerequisite to all courses in Criminal Justice. One session per week, 3 credits.

44.141 Police Functions: Theory and Applications

An examination of the historical development of police work with special emphasis on the conflicting role expectations facing the police officer. One session per week, 3 credits.

44.151 Introduction to Corrections I

A comprehensive view of theory, practice and philosophy involved in the treatment of convicted law violators of all ages. One session per week, 3 credits.

44.221 Criminology I

The definition and nature of crime, criminal statistics, and a survey of theories of crime causation will be included. Required for all majors. One session per week, 3 credits.

44.234 Criminal Law

The historical origins and development of criminal law from the early common law to contemporary decisions and statutes. Constitutional and statutory factors as they pertain to crime, defense, and crimes against persons and property will be considered. In addition, attention is directed toward limitations of criminal responsibility, capacity and the law of arrest. Sections of the Massachusetts Criminal Code and other statutes will be covered where applicable. One session per week, 3 credits. Prerequisite: 44.131.

44.243 Criminalistics I

Basic procedures in arrest, search and seizure, and the gathering as well as the evaluation of evidence as to admissibility, weight, and competence. One session per week, 3 credits. Prerequisite: 2 semesters of science.

44.244 Criminalistics II

Collection, identification, preservation, and transportation of physical evidence. The crime laboratory and its effectiveness, capabilities and limitations in assisting the police officer and utilizing

physical evidence as a means of apprehension and/or conviction. One session per week, 3 credits. Prerequisite: 44.243.

44.261 Juvenile Delinquency

Causative factors in the development of youthful offenders will be examined. The development and philosophy behind treatment of juvenile court and clinic, training schools, and contemporary innovative practices will be covered. One session per week, 3 credits.

44.321 Criminology II

An examination of theories of criminal behavior, both historical and contemporary, and their impact on the evolution of punishment, treatment and rehabilitative practices. One session per week, 3 credits. Prerequisite: 44.221.

44.331 Penal Law

A study of the constitutional rights of incarcerated individuals, including major policy issues and trends associated with recent revisions of penal codes reflecting court decisions for the preservation of offenders' rights. One session per week, 3 credits. Prerequisite: 44.234.

44.335 Juvenile Court Philosophy and Practice

Examination of the civil procedures used in the juvenile court as opposed to the adversary procedures used in criminal court, together with a history of the development of the juvenile court and an examination of its constitutional basis. One session per week, 3 credits. Prerequisite: 44.261.

44.341 Comparative Police Systems

A study of various police systems on the national and international level and a comparison with local systems on the basis of organization, structure, and administration of law enforcement agencies. Agencies in Europe, United Kingdom, Soviet Union and other parts of the United States will be reviewed. One session per week, 3 credits.

44.351 Alternatives To Corrections I

Modern trends in corrections, such as the community based programs in work-release, half-way houses, parole clinics, the therapeutic community, and team treatment concept in institutions are evaluated. One session per week, 3 credits. Prerequisite: 44.151.

44.354 Probation and Parole

The historical development of both probation and parole, and an examination of their place in the criminal justice system. There will be an emphasis on recent trends including diversion, flat sentencing, week-end sentencing, and the problems resulting from departure from traditional practices. One session per week, 3 credits.

44.360 Minorities and the Criminal Justice System

Both social and legal consequences of racism and discrimination will be discussed as they pertain to minorities and the criminal justice system. Because of the necessary reliance on some legal knowledge and legal reasoning, the following requirements are enforced: 44.234, 46.205 or 46.206. One session per week, 3 credits.

44.370 Criminal Justice Planning and Evaluation

An introduction to the principles of administration, including planning, budgeting, labor relations, grantsmanship and evaluation, as they relate to the criminal justice manager. One session per week, 3 credits.

44.371 Criminal Justice Management

A continuation of 44.370. One session per week, 3 credits.

44.372 Issues in Correctional Administration

Specific analysis of the management of correctional institutions, including custody, classification, reception, programming, release, staffing, scheduling, collective bargaining, and other related issues. One session per week, 3 credits. Prerequisite: 44.371.

44.373 Issues in Police Administration

Specific analysis of the management of contemporary police force, including staffing, scheduling, training, collective bargaining, community relations, and other related issues. One session per week, 3 credits. Prerequisite: 44.371

44.380 Selected Issues in Law and Justice

Topics chosen from current issues and problems in criminal justice. Subjects taken up in the course will vary, but will include such questions as victimology, social and psychological aspects of crime, crime control and deterrence, evaluation and policy research. One session per week, 3 credits.

44.390 Research Methods in Criminal Justice

An overview of the role of research in the criminal justice system, including terminology, standard methodologies, and elementary statistics. One session per week, 3 credits.

44.401 Seminar on Drugs

The course objective is designed to cover the problems of drugs, drug abuse, the law and its application. Treatment of and alternatives to drug rehabilitation will be studied in addition to the classification, identification, distribution, and control of drugs. One session per week, 3 credits.

44.490 Criminal Justice Research Seminar

Specific practice in the definition, design and execution of a research project, and an analysis of the impact of contemporary criminal justice research on policy development. On session per week, 3 credits. Prerequisite: 44.390.

44.496 Practicum - Field Experience I

Assigned field work under supervision and with permission of coordinator designed to broaden the educational experience of pre-service students in law enforcement and corrections by providing exposure in selected correctional, law enforcement, probation and parole agencies within the area. This course is designed to provide a correlation of theoretical knowledge with practical experience in an area of particular interest to the students. One session per week, 3 credits.

History

43.105 Western Civilization to 1715

Traces the major forces in the development of European history from the fall of the Roman Empire to 1715. One session per week, 3 credits.

43.106 Western Civilization Since 1715

Examines the major forces in the development of modern European history from the French Revolution to the present. One session per week, 3 credits.

43.111 United States History to 1877

Traces the development of American history and institutions from the colonization to the end of Reconstruction. (not open to history concentrators) One session per week, 3 credits.

43.112 United States History Since 1877

Examines significant developments in American history from the end of the Reconstruction period to the present. (not open to history concentrators) One session per week, 3 credits.

43.205 Ancient American Civilization

A study of the peoples and civilizations of the Americas from their origins to first contact with Europeans. One session per week, 3 credits.

43.228 The American Indian

A study of native Americans from their first contact with Europeans to the present, with special emphasis on North American Indians and their relationship with the United States government. One session per week, 3 credits.

43.237 American Environmental History

Attitudes, policies, and behavior of Americans and their government toward the environment. Special attention to current issues evolving out of our past attitudes and policies. One session per week, 3 credits.

43.239 American Economic History

A study of the growth and development of the American economy from its European origins to the present. One session per week, 3 credits.

43.277 Ethnic Groups in American Life

An examination of the importance of ethnic groups in American history. The course will treat several major ethnic groups and assimilation or non-assimilation into American life. Field work and research on ethnic groups in the Merrimack Valley. One session per week, 3 credits.

43.304 Recent U.S. History, 1940 to Present

The involvement of the U.S. in World War II marks a major turning point in American History. It ushers in twenty years of Cold War tensions, the militarization of society and participation in foreign alliances and limited wars. Anti-communist conservatives, militant Blacks and a New Left polarize politics and produce a contemporary crisis of confidence in American society. One session per week, 3 credits.

43.308 History of Crime, Conflict and Social Control in the U.S.

An analysis of the causes and development of attempts to control crime, ethnic conflict, radical and protest movements, urban disorders, and attitude and role conflicts. One session per week, 3 credits.

43.309 English Constitutional Law and Legal History

A survey inter-relating political and socio-economic structures to the evolution of the English constitutional and legal system. Special emphasis will be placed on the development of Common Law, the criminal law system and the "unwritten constitution." One session per week, 3 credits.

43.312 Modern Latin America

An analysis of significant trends and problems of Latin America, with emphasis on the cultural, economic, political, and social conditions which stimulate or deter progress. One session per week, 3 credits.

43.313 American Social History To 1880

Selected topics in American social history, including mobility and class structure in American life, American religions, ideals of family life and child rearing, race and ethnic groups in American life, myths and reality in American economic groups. One session per week, 3 credits.

43.314 American Social History Since 1880

A continuation of the preceding. One session per week, 3 credits. Prerequisite: 43.313.

43.316 History of Lowell

An examination of the history of industry, politics, and the culture of the city of Lowell. Work will be done largely in original sources and a research project is required. One session per week, 3 credits.

43.317 The American Frontier

Readings and discussion of the history of the American society and thought. One session per week, 3 credits.

43.324 The Rise of Industrial America

Selected topics in the economic history of the United States. Topics include: railroads and the development of a national market, the exploitation of national resources, the rise of new industries, the problems of labor, the consolidation of business, and the problems of agriculture in the new industrial state. One session per week, 3 credits.

Political Science

46.101 Introduction to American Politics

An introductory analysis of the structures, functions, and behavior of the American political community. The analysis will emphasize politics and political behavior at the national level. One session per week, 3 credits.

46.121 Introduction to International Relations

Surveys of some recent methods and approaches used in the study of international politics and the introduction to current problems of foreign policies of major world powers. One session per week, 3 credits.

46.230 Law and the Legal System

An introduction to the nature of the legal process and the operation of the American Legal System; considerations of its political and social functions. One session per week, 3 credits.

46.260 Public Administration

A study of the bureaucratic organization and behavior in the American society. The course covers the Federal Administration in process with a particular emphasis on the problems of bureaucratic authority versus democracy and social change. One session per week, 3 credits.

46.282 Contemporary Political Theory

An examination of major ideological currents in the contemporary world. Marxism, communism, fascism, anarchism, and the relevance of Freud to modern political thought are some of the possible topics for examination. One session per week, 3 credits.

46.344 The American Presidency

An examination of the nature of the American Presidency and its functioning within the American political system. Specific attention will be

given to the problems and the evolution of the Presidency since World War I. One session per week, 3 credits.

46.345 Constitutional Law & Politics

An advanced study of judicial review and judicial behavior as they have developed through the historical process of constitutional adjudication. Special emphasis is given to the continuing tension between judicial review and American democracy. One session per week, 3 credits.

46.347 Civil Liberties, Law, and Politics

An advanced examination of the developments of American concepts of civil liberty and equal rights through the historical process of constitutional adjudication, and in other areas of law, government, and society. One session per week, 3 credits.

46.356 Public Policy Analysis

The application of analytical techniques to the evaluation of governmental policy options. One session per week, 3 credits.

46.380 Contemporary American Foreign Policy

A study of the process of American foreign policy in the contemporary world. The case study method will be used to illustrate problems of strategy and tactics in such areas as Europe, Latin America, Africa, and the Near East. One session per week, 3 credits.

Psychology

47.101 General Psychology

A basic introductory course, primarily for non-concentrators, surveying the major areas of psychology, including the nature of psychology as a science, learning, human development and personality, perception, and motivation, behavioral disorders, and social behavior. One session per week, 3 credits.

47.163 The Human Life Span

Primarily for non-concentrators, this course surveys the major stages and processes in human development from birth to death. One session per week, 3 credits.

47.209 Social Psychology

A introduction to the study of social behavior in interpersonal relationships, groups, organizations, and the community. Topics include attitudes and attitude change, group dynamics, leadership, and inter-personal influences. One session per week, 3 credits.

47.232 Psychology of Personality

A survey of the major theories of personality, beginning with Freud and psycho-analysis, the neo-Freudians, existential psychology, humanistic theories of Rogers and Maslow, and behavioristic and social learning theories. The interplay between theory and research is also considered. One session per week, 3 credits.

47.255 Community Psychology

A survey of the nature and practice of community psychology, including principles of community organization and change, as seen in such areas as education, mental health, corrections, and social services. Students will participate in field research or practice under the direction of an assigned agency, and classroom work will include discussion of the field experiences of the participants. One session per week, 3 credits.

47.262 Adolescent Psychology

An examination of developmental issues during adolescence, including personality development and the emergence of identity, peer relations, the development of moral values, and sources of maladjustment. One session per week, 3 credits.

47.272 Abnormal Psychology

An introduction to the study of various patterns of neurotic, psychotic, and character disorders. Therapeutic techniques and other auxiliary methods for the treatment of such disorders are studied in relation to contemporary theory and research. One session per week, 3 credits. Prerequisite: 47.101.

47.328 Dynamics of Interpersonal Relations

An analysis of psychological dynamics in interpersonal behavior, emphasizing such topics as conformity, leadership, interpersonal growth, self-disclosure, personal styles of interaction, and technique of change. The primary focus will be on the behavior of the students themselves who form a small group in which they are expected to participate. The course is taught without a formal prerequisite, but students should have some previous course work in psychology. One session per week, 3 credits.

47.335 Psychology of Women

A consideration of such topics as: the psychology of sex differences; sex roles and socialization; sex stereotypes and attitudes toward women; women's self-concept and achievement; biological basis of psychological sex differences; the nature of female sexuality; clinical theory and practice concerning women; women as mental patients and mental health consumers; implications for psychology and for women's status. One session per week, 3 credits.

47.352 Psychological Tests and Measurement

A survey of several major tests used to assess such factors as mental abilities, vocational interest, attitudes, and personality. Students learn to administer, score, and interpret specific tests and the ways in which information is compiled to complete a case study of individuals tested. One session per week, 3 credits.

47.364 Psychology of Crime and Corrections

An investigation of the psychological aspects of crime and deviance, and the nature of punishment and rehabilitation. Clinical case histories or criminal personalities will be combined with experimental studies of anti-social and violent behavior. The nature of prisons and criminal justice will also be examined. One session per week, 3 credits. Prerequisite: 47.272.

47.371 Behavior Problems of Childhood

This course examines specific aspects of disorder occurring during childhood and early adolescence, including neurotic disorders, autism and psychosis, retardation and learning disabilities, and conduct disorders. Case histories and research dealing with assessment, etiology, and treatment will be presented. One session per week, 3 credits. Prerequisite: 47.261 or 47.272

47.473 Seminar in Social Psychology

Intensive study of one or more of the following special topics in social psychology including the following: psychology of the family and parent-child relations, moral development, adjustment during adulthood, death and dying, etc. One session per week, 3 credits. Prerequisites: 47.101, 47.209.

47.474 Seminar in Developmental Psychology

Careful consideration of selected topics in the area of human development, including the following: psychology of the family and parent-child relations, moral development, adjustment during adulthood, death and dying, etc. Prerequisites: 47.101, 47.163.

Sociology

48.101 Introduction to Sociology

This is the basic course in sociology. Emphasis is directed at the ways in which social institutions such as government, schools, the economy, social class, and the family develop and influence our lives. It is concerned not only with presenting various ways to understand our relationship to society, but also with ways to change it. One session per week, 3 credits.

48.201 Social Anthropology

Using the comparative approach to the study of society, this course examines several distinct cultures as a means of understanding both the universal constants and the variations in human societies. One session per week, 3 credits.

48.220 Self Assessment & Career Development

A study of the meaning of work in our society. Class participants will assess their own life experiences and develop plans to integrate interests, values, and abilities into meaningful and realistic life/work options. One session per week, 3 credits.

48.231 The Sociology of the Family

A study of the nature of the family in contemporary society with particular emphasis on the family in America. What functions does the family perform in modern society? How is it changing? How do these changes affect our lives? One session per week, 3 credits.

48.234 The Study of Minorities

This course examines the process of immigration and majority-minority relations in the U.S. over the last century with particular emphasis on the process of adaptation in a pluralistic society. One session per week, 3 credits. Prerequisite: 48.101.

48.256 Political Sociology

This course focuses on the development and use of power in modern society. Emphasis is placed on the relationship of American political institutions to economic institutions, to social class, and to supporting ideologies. One session per week, 3 credits. Prerequisite: 48.101.

48.323 Sociology of Ideas and Values

This course is geared to the student with little or no background in sociology or philosophy and seeks to clarify what we mean by values, ideas and concepts. The course investigates the social processes that affect the way we perceive and think about objects, social events, and interpersonal relations. The source of "correct" ideas is investigated. Ideology and culture are studied closely. Science and technology are analyzed as social processes. The question of values is brought up in relation to technology, the quality of life, and our relationship to nature. One session per week, 3 credits.

48.341 Social Stratification

This course focuses on the phenomenon of social class distinctions with particular emphasis on social class in America. The approach taken is both historical and sociological. One session per week, 3 credits. Prerequisite: 48.101.

48.345 Urban Sociology

This course deals with issues related to the quality of life in American cities. Students taking this course may engage in research projects on the city of Lowell and the role of the University of Lowell within that city. One session per week, 3 credits.

48.351 The Sociology of Health and Health Care

A historical and contemporary study of the socio-politics of health, illness, and the health care industry in the United States. Attention is given to providers, consumers, owners, workers, and professionals in terms of their power, class, race, sex, and age. Reforms and alternatives are considered. One session per week, 3 credits. Prerequisite: 48.101.

48.361 Sociology of Law and the Criminal Justice System

Introduction to the theory, structure, ideology, and practice of the criminal justice system. Particular attention is directed at the definition of crime and the impact of social, political, and economic policy on the operation of systems and their impact on its "clients". One session per week, 3 credits. Prerequisite: 48.101.

88.110 Man and His Environment

An inter-disciplinary study of the technological, scientific, psychological, economic and sociological response of man to his environment. Case studies include world, regional and local issues and problems. One session per week, 3 credits.



Fine Arts and the Humanities

(See Area Distribution Requirements, p. 14)

Art

57.255 Drawing I Studio

A foundation course in basic concepts and techniques using a variety of drawing media. The emphasis is on realism and its application to the realm of ideas. A wide range of assignments are given to develop graphic expression. One session per week, 3 credits.

57.271 Painting I Studio

Oil painting techniques are taught as vehicles for serious creative expression. A variety of assignments will be given to help the student gain proficiency in the use of color technique and subject matter. One session per week, 3 credits.

57.355 Drawing II Studio

An advanced course in drawing and an outgrowth of 57.255. The course includes a wide range of media and subject matter. Emphasis is on development of personal expression, style and the understanding of non-objective concepts. One session per week, 3 credits. Prerequisite: 57.255.

57.371 Painting II Studio

This course is designed to allow students to develop individual style through a variety of problems, both self initiated and assigned by the instructor. One session per week, 3 credits. Prerequisite: 57.271.

58.101 Appreciation of the Visual Arts

An analysis of the visual elements used in art such as color, line, and shape. Emphasis is placed on modes of representation, styles, media, technical procedures, and principles of design. One session per week, 3 credits.

58.203 Survey of Art I

A survey of the major Western arts from earliest time to the Middle Ages presented chronologically. Emphasis is placed upon the changing nature of the style and content within sequential cultural contexts. The aim of the course is to introduce the student to basic critical and art historical methods. One session per week, 3 credits.

58.204 Survey of Art II

A survey of the major Western arts from Renaissance to the 20th century presented chronologically. Emphasis is placed upon the changing nature of the style and content within sequential cultural contexts. The aim of the course is to introduce the student to basic critical and art historical methods. One session per week, 3 credits.



English

(Composition)

42.101 College Writing I

This course will be concerned with the preparation of expository and argumentative essays and with the critical reading of non-fiction; it will include a study of the techniques and documentation of research. One session per week, 3 credits.

42.102 College Writing II

This course will be concerned with written and classroom work that reinforces the substance of 42.101. Imaginative literature representative of the major types will be studied as a basis for further developing competence in writing. One session per week, 3 credits.

NOTE: Before enrolling in any English course numbered 42.224 or higher, students must complete 42.101, 42.102 to fulfill the University requirement of 6 hours in composition.

42.224 Business Writing

A study of the theory and practice of letters, memoranda, and reports on specific business and technical problems. Registration preference for students enrolled in Business and Management programs. One session per week, 3 credits. (may not also take 42.225)

42.225 Technical & Scientific Communication

A study of theory and practice of letters, memoranda, and reports on specific scientific and technical problems. Registration preference for students enrolled in the Engineering Technology and Science programs. One session per week, 3 credits. (may not also take 42.224)

(Literature)

42.201 Great Books of Antiquity

Representative literary selections from the Bible, classical Greece and imperial Rome are studied as embodiments of ancient views of life and reality. One session per week, 3 credits.

42.203 Great Books of the Modern Period

Representative literary selections from the period of the Enlightenment to the present are studied as embodiments of modern views of life and reality. One session per week, 3 credits.

42.205 Human Values in Western Culture I

A close study of representative literary, philosophical, and religious texts from ancient times to

the present, and relevant modern works in the behavioral and political sciences. In the first semester, the students explore and evaluate three perennial themes: the problem of evil, self and society, freedom and fate. One session per week, 3 credits.

42.206 Human Values in Western Culture II

A continuation of 42.205. May be taken independently. Themes to be explored include the pursuit of knowledge, the nature of mankind, and experience of love. One session per week, 3 credits.

42.212 The Short Story

A study of the development of the genre. One session per week, 3 credits.

42.215 The Modern Essay

A study of the essay as the literature of ideas. Concentration of twentieth century writers with attention to early examples of the genre. One session per week, 3 credits. Prerequisites: 42.101, 42.102.

42.216 The Short Novel

A study of nineteenth and twentieth century short novels as a literary genre. One session per week, 3 credits. Prerequisites: 42.101, 42.102.

42.217 The Horror Story

A study of the genre from Poe to the present. One session per week, 3 credits.

42.230 Elements of Film

A study of the elements of film as revealed in selected film classics with emphasis on analysis and evaluation. One session per week, 3 credits.

42.240 Literature and Women

A survey of literary attitudes towards women from the Judaic and Hellenic periods through the contemporary. One session per week, 3 credits.

42.242 The Heroine in Modern Fiction

A study of selected short stories and novels which deal sympathetically with the changing roles of women. One session per week, 3 credits.

42.246 The Rogue in Fiction

A study of the picaresque hero depicted by such writers as Cervantes, Defoe, Fielding, Cary, Donleavy, and Bellow, including attention to theories of comedy. One session per week, 3 credits.

42.250 The Bible as Literature

A literary and historical analysis of selected Old and New Testament books. One session per week, 3 credits.

42.267 Introduction to Shakespeare

A study of selected histories, comedies, and tragedies. One session per week, 3 credits.

42.291 History of English Literature I

A study of the historical development of English literature from the beginnings to Milton. Selected works by representative authors from each period are studied. One session per week, 3 credits.

42.292 History of English Literature II

A study of the historical development of English literature from Dryden to the beginning of the twentieth century. One session per week, 3 credits.

42.294 History of American Literature I

A study of the historical development of American literature from the Colonial period to the Civil War. Selected works by representative authors from each period are studied. One session per week, 3 credits.

42.295 History of American Literature II

A study of the historical development of American literature from the Civil War to World War I. One session per week, 3 credits.

42.296 History of American Literature III

A study of twentieth century American short stories, novels, poetry and drama. One session per week, 3 credits.

42.317 British Literature of the Twentieth Century

A study of British short stories, novels, poetry, and drama. One session per week, 3 credits.

42.362 Modern Drama

A study of selected continental, British, and American plays of the late nineteenth century to the present. One session per week, 3 credits.

Languages

(French)

50.101 Beginning French I*

Development of fundamental skills in oral expression, aural comprehension, reading and writing. Tapes available for laboratory use. Students who have completed more than one year of French at the secondary level are ineligible for this course. One session per week, 3 credits.

50.102 Beginning French II*

A continuation of 50.101, which is a prerequisite. One session per week, 3 credits.

50.211 Intermediate Conversational French I*

Review of basic grammatical structures and idiomatic patterns with emphasis upon increased proficiency in oral expression and aural comprehension. This course is intended for students who have completed two years of high school French, preferably during their junior and senior years, for students who have completed 50.102. One session per week, 3 credits.

50.212 Intermediate Conversational French II*

A continuation of 50.211, which is a prerequisite, with emphasis upon continued development of comprehension and conversational skills. One session per week, 3 credits.

(German)

51.101 Beginning German I*

Development of fundamental skills in oral expression, aural comprehension, reading, and writing. Tapes available for laboratory use. Students who have completed more than a 1 year of German at the secondary level are ineligible for this course. One session per week, 3 credits.

51.102 Beginning German II*

A continuation of 51.101, which is a prerequisite. One session per week, 3 credits.

(Spanish)

54.101 Beginning Spanish I*

Development of fundamental skills in oral expression, aural comprehension, reading, and writing. Tapes available for laboratory use. Students who have completed more than one year of Spanish at the secondary level are ineligible for this course. One session per week, 3 credits.

54.102 Beginning Spanish II*

A continuation of 54.101, which is a prerequisite. One session per week, 3 credits.

54.211 Intermediate Conversational Spanish I*

A review of Spanish grammar and syntax with emphasis upon increased proficiency in aural comprehension and oral expression. This course is intended for students who have completed two years of high school Spanish, preferably during their junior and senior years, for students who have completed 54.102. One session per week, 3 credits.

54.212 Intermediate Conversational Spanish II*

A continuation of 54.211, which is a prerequisite, with emphasis upon continued development of comprehension and conversational skills. One session per week, 3 credits.

54.245 Advanced Spanish Conversation

Advanced oral fluency in rapid and idiomatic speech. Topics of contemporary significance will be selected from contemporary prose. One session per week, 3 credits.

54.254 Topics in Conversational Spanish

Discussion of a wide spectrum of contemporary topics with the object of continuing to develop facility and accuracy of expression. Prerequisite: advanced level proficiency. One session per week, 3 credits.

**Beginning and intermediate language courses at the 101-102 and 211-212 levels must be elected for two consecutive semesters and in the prescribed sequence. College credit may not be granted for one semester of such courses unless exception is permitted by the Chairperson of the Department of Languages on the basis of student placement in a more advanced language course.*

Philosophy

45.201 Introduction to Philosophy

An examination of some of the typical approaches to philosophical questioning and the issues raised in such inquiry: what is true knowledge, what is reality, what is the good, what is the right political order, what is the nature of religious faith? One session per week, 3 credits.

45.202 Introduction to Logic

A course designed to study the methods used to distinguish correct from incorrect reasoning. It will aim at developing (1) an ability to express one's ideas clearly and concisely, (2) an increased skill in defining one's terms, and (3) a capacity to formulate arguments vigorously and to scrutinize them critically. One session per week, 3 credits.

45.203 Introduction to Ethics

An examination of the basic issues and problems of ethics and value and a survey of some important alternative answers to the questions raised, on both an individual and a social level, by our necessity to act and to live in a rational and human way. One session per week, 3 credits.

45.310 Intermediate Logic

The course will cover modern symbolic logic including both propositional and predicate logic. Emphasis on what can or cannot be proven by mechanical proof procedures. Some of the most important results of modern logic, including Goedel's incompleteness theorem, will be presented and their relevance for computer science will be explored. One session per week, 3 credits.

College of Management Sciences

Benjamin Chinitz, Dean; B.A., M.A., Ph.D

Joseph Thomas, Assistant Dean; B.S., M.M.S., M.P.A., D.P.A.

Santo J. Pullara, Coordinator: B.S., M.B.A., J.D., Ph.D.

The Associate of Science degree in Accounting, Banking, and Management is the only degree program which is now offered under the jurisdiction of the College of Management Science. Program admissions for Bachelor of Science degree programs in accounting, banking, and management have been discontinued by the College of Management Science for beginning continuing education students. Students currently matriculating in these programs are advised that the Bachelor of Science degree no longer will be awarded after the Fall 1987 Term. For course requirements refer to earlier bulletins.

Students Commencing Studies After Spring 1985 Semester

Continuing Education students who begin their studies after the Spring 1985 Semester and who wish to pursue accounting, banking, or management programs may establish matriculation only in associate degree programs. Students who complete accounting, banking, or management programs at the associate level and who wish to pursue a baccalaureate program may seek admission to the Bachelor of Science in Information Systems (offered by College of Pure & Applied Science).

Transfer to Bachelor of Science in Business Administration Program (Full or Part-Time Day Program)

Associate degree students who desire to graduate with the degree of Bachelor of Science in Business Administration must seek formal admission as a transfer student to the day program of the College of Management Science. Admission to the Bachelor of Science in Business Administration degree program is restricted to students who have maintained a 2.0 cumulative grade-point average and who have completed a minimum of 60 semester credits, including certain basic courses in required subjects, either at the University or at another accredited institution. Students should consult with the Assistant Dean of the College of Management Science concerning policies and procedures which govern transfer to the Bachelor of Science in Business Administration program. Such consultation will determine which courses can be accepted without validation for transfer credit. Students who are accepted for transfer to this program will be permitted to pursue their day studies full-time or (in conformity with regulations of the Second Chance Program) on a part-time basis.

Students who are accepted for transfer to the Bachelor of Science in Business Administration program are subject to a validation requirement. Validation generally will be required if an upper-level course of the Bachelor of Science in Business Administration program has been completed prior to transfer acceptance. For example, an applicant who has completed a course in marketing or finance must be subject to the validation procedure. For consideration, a course must be completed with a grade of "C" or higher. The College of Management Science will accept transfer business credits without validation only for courses which are equivalent to Accounting I & II, Statistics I & II, Economics I & II, Business Law I & II, and Basic with Business Application.

Other business courses may be transferred through a validation process which includes a written examination in the specific subject area of the course to be transferred. Certain associate degree courses (e.g., Real Estate, Finance, Risk Management and Insurance) are not transferable as business requirements because they have no comparable equivalent in the Bachelor of Science in Business Administration program. However, such courses can be counted as unrestricted general electives.

I
Accounting
Associate of Science Degree – 63 Credits

Suggested Course Sequence

FIRST YEAR

First Semester (Sept.)			Second Semester (Jan.)		
Subject No.		Credits	Subject No.		Credits
67.201	Accounting Principles I	3	67.202	Accounting Principles II	3
68.201	Economics I	3	68.202	Economics II	3
42.101	College Writing I	3	42.102	College Writing II	3
		<u>9</u>			<u>9</u>

SECOND YEAR

90.112	Algebra for Management I	3	90.119	Algebra for Management II	3
67.301	Intermediate Accounting I	3	67.302	Intermediate Accounting II	3
42.224	Business Writing	3	42.222	Oral Communication	3
		<u>9</u>			<u>9</u>

THIRD YEAR

47.101	General Psychology	3	69.331	Business Finance	3
67.411	Cost Accounting I	3	48.101	Intro to Sociology	3
92.209	Intro to Basic OR	3	90.241	Statistical Concepts I	3
92.219	Basic Programming	3			<u>9</u>
		<u>9</u>			

FOURTH YEAR

69.332	Money and Banking	3
67.362	Business Law	3
.....	Area II Elective	3
		<u>9</u>

II
Banking
Associate of Science Degree – 63 Credits

Suggested Course Sequence

FIRST YEAR

First Semester (Sept.)			Second Semester (Jan.)		
Subject No.		Credits	Subject No.		Credits
42.101	College Writing I	3	42.102	College Writing II	3
67.201	Accounting Principles I	3	67.202	Accounting Principles II.....	3
69.101	Principles of Banking	3	69.102	Bank Management.....	3
		<u>9</u>			<u>9</u>

SECOND YEAR

68.201	Economics I	3	68.202	Economics II	3
90.112	College Algebra for Management I ...	3	90.119	College Algebra for Management II...	3
42.224	Business Writing	3	42.222	Oral Communication.....	3
		<u>9</u>			<u>9</u>

THIRD YEAR

69.105	Consumer Lending	3	69.104	Analyzing Finan. Statement.....	3
47.101	General Psychology	3	48.101	Intro to Sociology	3
92.209	Intro to Basic OR	3	90.241	Statistical Concepts I	3
92.219	Basic Programming	9			<u>9</u>

FOURTH YEAR

69.111	Negotiable Instruments	3
69.332	Money & Banking	3
.....	Area II Elective	3
		<u>9</u>

III Management Associate of Science Degree – 63 Credits

Suggested Course Sequence

FIRST YEAR

First Semester (Sept.)		Second Semester (Jan.)	
Subject No.	Credits	Subject No.	Credits
67.201	Accounting Principles I .....3	67.202	Accounting Principles II.....3
68.201	Economics I .....3	68.202	Economics II .....3
42.101	College Writing I <u>3</u>	42.102	College Writing II <u>3</u>
	9		9

SECOND YEAR

69.201	Principles of Management .....3	69.331	Business Finance .....3
42.224	Business Writing .....3	90.119	College Algebra for Management II...3
90.112	College Algebra for Management Science I <u>3</u>	42.222	Oral Communication.....3
	9		9

THIRD YEAR

90.241	Statistics for Business I.....3	69.371	Operations Management.....3
66.321	Marketing Principles .....3	47.101	General Psychology .....3
92.209	Intro to Basic OR <u>3</u>	67.362	Business Law I <u>3</u>
92.219	Basic Programming <u>9</u>		9

FOURTH YEAR

69.332	Money and Banking .....3
.....	Area II Elective .....3
69.451	Personnel Management..... <u>3</u>
	9

Accounting

67.201 Accounting Principles I

Presents a comprehensive and detailed exposure to basic accounting theory. Beginning with the accounting equation, the student is introduced to the accounting cycle, preparation of the Statement of Financial Position and the Income Statement, and accounting for the assets of a firm. One session per week, 3 credits.

67.202 Accounting Principles II

Emphasizes the accounting for corporations, treatment of stockholders equity, earnings and dividends. Examines the Statement of Changes in Financial Position, cash flow causes and effects, and financial statement analysis. One session per week, 3 credits. Prerequisite: 67.201.

67.301 Intermediate Accounting I

This course examines the generally accepted accounting principles relating to the preparation of financial statements. The student will study in depth the valuation and disclosure problems associated with the assets of the firm. One session per week, 3 credits. Prerequisite: 67.202.

67.302 Intermediate Accounting II

This course continues the in-depth study of the valuation and disclosure problems associated with corporate liabilities and stockholders equity. Emphasis is placed on the opinions of the Accounting Principles Board and Financial Accounting Standard Board. One session per week, 3 credits. Prerequisite: 67.301.

67.311 Managerial Accounting

An in-depth examination of the use of accounting systems for managerial decision-making. Budgeting, forecasting, and cost accumulations systems which relate to the manufacturing firm will be studied. One session per week, 3 credits. Prerequisite: 67.202 (For non-accounting majors.)

67.362 Business Law I

Principles of commercial law encompassing a study of contracts, agency, employment, commercial paper and sales including the Uniform Commercial Code. One session per week, 3 credits.

***67.363 Business Law II**

The analysis of the legal principles underlying real and personal property, corporations, partnerships, trusts, and estates. One session per week, 3 credits. Prerequisite: 67.362.

67.401 Advanced Financial Accounting I

This course explores theoretical and practical problems in accounting for large, multicorporation business entities. Consolidation, mergers, and home office/branch accounting receive in-depth study. One session per week, 3 credits. Prerequisite: 67.302.

***67.402 Advanced Financial Accounting II**

This course offers a comprehensive study of partnership accounting, accounting for installment and consignment sales, and also includes an introduction to accounting for non-profit organizations (government, educational units and hospitals.) One session per week, 3 credits. Prerequisite: 67.401.

67.411 Cost Accounting I

An examination of the manufacturing function from the view of the cost accountant. Managerial control of the elements of product costs will be studied with an emphasis on cost accumulation systems both historical and estimated. One session per week, 3 credits. Prerequisite: 67.202.

***67.412 Cost Accounting II**

Topics covered will include standard (estimated) costs, variance analysis, profit planning, cost-volume-profit analysis, and relevant cost analysis for problem solving. One session per week, 3 credits. Prerequisite: 67.411.

67.421 Auditing I

An examination of purposes of financial auditing and operations auditing. The following topics will be examined in depth: auditing, standards, professional ethics, legal responsibilities, internal control, audit evidence, financial statements, disclosures, audit reports, management advisory services, and internal auditing. One session per week, 3 credits. Prerequisite: 67.302.

***67.422 Auditing II**

An examination of audit procedures as they relate to the various audit segments: i.e. cash, fixed assets, owners equity, etc. This will be implemented via the use of text material and a comprehensive audit case. Statistical sampling will be covered in depth via the use of text material and cases when available. One session per week, 3 credits. Prerequisite: 67.421.

*This course will not be offered after 1987.

***67.431 Federal Income Taxes**

This course deals with the basic rules and regulations of the Internal Revenue Code as it affects the individual and the corporation. An understanding of the code is developed through lectures, assigned readings, research, and the solution to a wide variety of problems. One session per week, 3 credits. Prerequisite: 67.202.

*This course will not be offered after 1987.

Banking

69.101 Principles of Banking

This course fulfills the same role as the "Principles of Bank Operations" course it replaces; however, it provides an updated and broader perspective of the banking industry. Principles of Banking touches on nearly every aspect of bank functions. Included is a comprehensive introduction to banking in today's economy. Discussions on specific topics are presented in an easily accessible form. The language and documents of banking, check processing, teller functions, deposit function, trust services, bank bookkeeping, and bank loans and investments are some primary topics. The course ends with a discussion of the bank's role in the community. One session per week, 3 credits.

69.102 Bank Management

This course presents trends which have emerged in the philosophy and practice of bank management. The study and application of the principles outlined provides new and experienced bankers with a working knowledge of bank management. It touches on objectives, planning, structure, control, and interrelationship of various bank departments. One session per week, 3 credits.

69.104 Analyzing Financial Statements

This course offers the student tools and techniques necessary for the evaluation of financial condition and operating performance of a modern business enterprise. The course is divided into four parts: Financial Statement Analysis and Accounting; Financial Statements and Business Funds Flow; Tools of Financial Statements Analysis; and the Technique of Financial Statement Analysis. One session per week, 3 credits. Prerequisite: 67.201.

**69.105 Consumer Lending**

This modular course emphasizes the pragmatic "how-to" details of installment credit. Topics covered are principles of credit evaluation, open-end credit, marketing bank services, collection policies and procedures, legal aspects, financial statement analysis, direct and indirect installment lending, leasing and other special situations, installment credit department management, insurance, rate structure and yields. One session per week, 3 credits.

69.106 Real Estate Finance

This course provides a background in the varied real estate mortgage credit operations of commercial banks. It treats the main areas of real estate by concentrating on the following broad areas: 1) the manner in which funds are channeled into the mortgage markets; 2) the financing of residential property; 3) the financing of special purpose property; and 4) the administrative tasks common to most mortgage departments. One session per week, 3 credits.

69.107 Bank Investments

The objectives of this course are to explain the nature of the more important bank investments, to demonstrate the relationship of investment management to other functional areas of the bank, and to discuss the factors that affect investment strategies and decisions. Emphasis throughout is on the basic principles with which investment personnel should be familiar — fundamentals such as the nature of risk, liquidity, and yield; how each is measured; and how they are related. One session per week, 3 credits. Prerequisite: 69.101.

****69.108 Trust Functions and Services**

This course provides an overview of many of the generally accepted principles of the law of estates, trusts, and agencies as it takes the student on a step-by-step of trust functions and services encountered in the daily operation of a trust department. The appendices of the text contain illustrative instruments including a will, a trust agreement, and an investment management agency agreement. For the student who is not familiar with legal and trust terms, a detailed glossary is included. One session per week, 3 credits. Prerequisite: 69.101.

****69.109 Marketing for Bankers**

This course presents marketing as a broad concept. It deals with concepts and philosophies of marketing; information, research, and target; the marketing mix (product strategy, distribution strategy, advertising and sales promotion, personal selling, and pricing strategy); and the methods of market planning. One session per week, 3 credits.

****69.110 Savings & Time Deposit Banking**

This course reflects recognition of the fact that a knowledge of the historical development of savings institutions and awareness of the basic economic function of the savings process are necessary to an understanding of the current operations and policies of these institutions. Different types of financial savings are reviewed in order to describe the system of financial flow from income to capital investment. Interest rates, types of savings accounts, and management of savings institutions are also covered. One session per week, 3 credits.

69.111 Negotiable Instruments and the Payments Mechanism

The objective of this course is to explore the relevant legal implications of normal activities and transactions in bank operations. The treatment is in general terms. It is designed to add knowledge of legal principles and reasoning to the student's understanding and vocational skill and to influence attitudes of bank personnel by providing information about the impact of the law and applicable bank regulations rather than the resolution of legal issues or problems. The aim is to improve understanding of how the law operates within the framework of federal and state banking statutes, court decisions, and administrative regulations. One session per week, 3 credits.

****69.112 Corporate Banking**

This practical, common sense approach to lending incorporates the exact sequential nature of the lending process, giving bankers a solid foundation on which to construct sound lending practices. One session per week, 3 credits.

****69.113 Credit Department Management**

This course presents an excellent overall perspective of the credit department. It gives a thorough understanding of the basic principles underlying credit function and strengthens management performance through highly interactive educational format. Topics covered are management, organization, and staffing; credit files, spreading financial statements; the commercial credit analysis function; loan quality control and compliance functions; commercial credit information exchange and the training function. One session per week, 3 credits.

****69.114 Retail Banking**

The course consists of four topics; Retail Management, Sales Management, Financial Performance of Banks, and Selling Skills for Bankers.

****69.115 Introduction to Commercial Lending**

Provides an introductory overview of the commercial lending function and stresses the need for a solid relationship between a bank's commercial customers and the lending officer as well as the importance of commercial loans to a bank's portfolio. One session per week, 3 credits.

****This course will be available for American Institute of Banking (AIB) certification but not for any Associate Degree program in Accounting, Banking, or Management at the University of Lowell after 1987.**

Economics

68.201 Economics I (Microeconomics)

A study of the principles governing the production and exchange of goods and services. One session per week, 3 credits. Prerequisite: 90.111.

68.202 Economics II (Macroeconomics)

A study of the principles governing the level of national income and employment. Examination of the commercial banking system, monetary and fiscal policy, the international economy, and alternative economic system. One session per week, 3 credits. Prerequisite: 90.111.

***68.307 Government Business & Society**

An examination of the various governmental controls over business in the American economy. One session per week, 3 credits. Prerequisites: 68.201 or 68.202.

***68.301 Current Economic Problems**

Selected problems which confront the contemporary American economy. One session per week, 3 credits. Prerequisites: 68.201 or 68.202.

***68.312 Managerial Economics**

An economic approach to management decisions. This subject draws upon economic analysis to help formulate policy in such matters as capital budgeting, multiple product decisions, demand analysis, and competitive action. One session per week, 3 credits. Prerequisites: 68.201 or 68.202 and 90.242.

*This course will not be offered after 1987.

Management

69.201 Principles of Management

Introduction to the principles of management, including the functions of planning, directing, organizing, and control and relation to business. One session per week, 3 credits.

69.321 Marketing Principles

Product planning, distribution, promotion and pricing studied in the context of consumer behavior, governmental constraints and the structure of business institutions. One session per week, 3 credits. Prerequisite: 68.201.

69.331 Business Finance

Principles of financial management, including working and fixed capital sources of funds, financial statements, budgeting and capitalization. One session per week, 3 credits. Prerequisites: 67.201, 68.201, 68.202.

69.332 Money and Banking

Evolution of money and credit and their role in the economy. Monetary policy and the Federal Reserve System. Structure and function of the commercial banking system and the role of other financial institutions. One session per week, 3 credits. Prerequisites: 68.201, 68.202.

69.353 Organizational Behavior

Applications of concepts from the behavioral sciences to individual and group activity in organizations. Use of behavioral concepts to introduce and implement organizational change. One session per week, 3 credits. Prerequisites: 47.101, 48.101.

69.371 Operations Management I

Principle of production/operations management. Nature and function of production systems; operation planning and control; plant layout; materials handling; inventory and quality control. One session per week, 3 credits. Prerequisite: 90.241.

***69.372 Operations Management II**

Cases on the application of principles from 69.371 to problems involving continuous, intermittent and job lot production systems for both small and large firms. One session per week, 3 credits. Prerequisite: 69.371.

***69.421 Purchasing and Materials Management**

Purchasing procedures, inventory control, quality control, source selection, forward buying and speculation for the production enterprise. One session per week, 3 credits. Prerequisite: 69.321.

***69.426 Sales Management**

Management of the personal selling function. Principles of sales force organization, selection, training, compensation, supervision and motivation are explored via appropriate cases. One session per week, 3 credits. Prerequisite: 69.321.

***69.434 Investment Management**

Principles of investment: security analysis, portfolio management, market analysis. One session per week, 3 credits. Prerequisite: 69.331.

69.451 Personnel Management

Recruitment, selection and training of the work force. Wage and salary administration, employee health and safety, welfare and education. One session per week, 3 credits. Prerequisite: 69.201.

***69.452 Industrial Relations**

Human interaction and group behavior in organized industrial settings. Union-management relations, grievance procedures, collective bargaining, and arbitration. One session per week, 3 credits. Prerequisite: 69.451.

***69.481 Risk Management and Insurance**

Analysis of pure risks of economic loss and evaluation of various methods of dealing with risk. Development and implementation of risk management programs for the business firm. One session per week, 3 credits.

***69.410 Current Management Problems in Business and Industry I**

Special problems of management in working with personnel of minority groups, blacks, women, ethnic groups and others. Extensive use is made of case studies, group projects and field studies. One session per week, 3 credits.

***69.411 Current Management Problems in Business and Industry II**

Advance section to 69.410. Complex problems of job boredom, worker alienation and corporate social responsibility. Solutions to these problems and problems in 69.410 will be given in workshop setting. Current relevant case studies with individualized solutions. One session per week, 3 credits. Prerequisite: 69.410.

***69.412 Small Business Management Seminar**

A course for advanced students to study peculiar problems of small business in operations, marketing, accounting, finance and personnel, with emphasis on contemporary problems, through case problems and readings. Open to students with 72 credits towards the B.S. degree or permission of Program Coordinator. One session per week, 3 credits.

***69.414 Business Systems and Procedures**

A study of techniques for improved managerial controls and reduction of operating costs through improved systems. Topics covered include increased profits through improved systems, records management, information retrieval, and long range planning for business. One session per week, 3 credits. Prerequisite: 69.201.

***69.416 Collective Bargaining Agreement**

The nature and content of current bargaining agreements. Included will be the collective bargaining process including negotiations, mediation and arbitration. Case studies in labor management relations involving the entire labor agreement and relationship. One session per week, 3 credits. Prerequisite: 69.452.

***69.417 Real Estate**

The study of evaluation, legal, financial, and regulatory aspects of real estate management. One session per week, 3 credits.

***69.498 Business Policy**

An integration of knowledge in the various functional areas of management toward solution of problems affecting the character and success of the total enterprise. Corporate strategy and its implementation via appropriate policies. One session per week, 3 credits. Prerequisite: senior status.

*This course will not be offered after 1987.

College of Pure & Applied Science

Nicholas Rencricca, Acting Dean; B.S., M.S., Ph.D
Raymond Hardy, Assistant Dean; B.S., M.S.
Philip S. Lamprey, Chemistry Coordinator; B.S., Ph.D.
Ann Marie Hurley, Computer/Information Systems Coordinator; B.S., M.S.
Alan W. Doerr, Mathematics Coordinator; B.A., M.A.

The College of Pure & Applied Science offers the following Continuing Education undergraduate programs: Associate of Science (Applied Chemistry, Information Systems, Applied Mathematics) and Bachelor of Science (Applied Chemistry, Information Systems, Applied Mathematics [Computer options available].)

I Applied Chemistry

Associate of Science & Bachelor of Science Degrees

Suggested Course of Study
Years 1-4 Leading to the Degree of Associate of Science

FIRST YEAR

First Semester (Sept.)			Second Semester (Jan.)		
Subject No.		Credits	Subject No.		Credits
84.121	Chemistry I	3	84.122	Chemistry II	3
90.113	College Algebra	3	92.115	College Trigonometry	3
42.101	College Writing I	3	42.102	College Writing II	3
		<u>9</u>			<u>9</u>

SECOND YEAR

86.121	Analytical Chemistry	3	86.122	Analytical Chemistry	3
90.131	Calculus I	3	90.132	Calculus II	3
99.131	Technical Physics I	3	99.132	Technical Physics II	3
		<u>9</u>			<u>9</u>

THIRD YEAR

84.223	Princ. of Organic Chem. I	3	84.224	Princ. or Org. Chem. II	3
84.225	Princ. of Organic Chem. Lab I	1	84.226	Princ. of Org. Chem. Lab II	1
17.127	Electrical Fundamentals	3	99.133	Technical Physics III	3
		<u>7</u>			<u>7</u>

FOURTH YEAR

84.344	Physical Chemistry I	3	84.345	Physical Chemistry II	3
84.346	Physical Chemistry Lab I	1	84.347	Physical Chem. Lab II	1
.....	Elective	3	.....	Elective	3
		<u>7</u>			<u>7</u>

All electives shall be chosen after conference with the Program Coordinator and MUST be approved by him.

Years 5-8 Leading to the Degree of Bachelor of Science

FIFTH YEAR

First Semester (Sept.)		Second Semester (Jan.)	
Subject No.	Credits	Subject No.	Credits
84.334	Advanced Inorganic Chemistry .....3	86.352	Chemical Applications .....3
92.383	Introduction to Statistics .....3	92.263	Fortran Programming .....3
42.225	Tech. & Sci. Communications .....3	.....	Area II Elective .....3
	<u>9</u>		<u>9</u>

SIXTH YEAR

86.361	Advanced Organic Chemistry .....3	86.362	Advanced Organic Chem. ....3
27.201	Plastics Material Science .....3	69.201	Principles of Management .....3
.....	Area II Elective .....3	22.295	Materials Science .....3
	<u>9</u>		<u>9</u>

SEVENTH YEAR

86.471	Industrial Chemistry .....3	84.314	Analytical Chemistry II .....3
68.201	Economics I .....3	84.316	Anal. Chemistry II Lab .....1
.....	Area I or II Elective .....3	68.202	Economics II .....3
	<u>9</u>		<u>7</u>

EIGHTH YEAR

86.481	Chemistry of High Polymers .....3	86.482	Chem. of High Polymers .....3
.....	Elective .....3	.....	Human Values Elective .....3
.....	Elective .....3	.....	Elective .....3
	<u>9</u>		<u>9</u>

All electives shall be chosen after conference with the Program Coordinator and MUST be approved by him.



II Applied Mathematics

Associate of Science & Bachelor of Science Degrees

Years 1-4 Leading to the Degree of Associate of Science

FIRST YEAR

First Semester (Sept.)		Second Semester (Jan.)	
Subject No.	Credits	Subject No.	Credits
68.201	Economics I .....3	68.202	Economics II .....3
90.113	College Algebra .....3	92.115	College Trigonometry .....3
42.101	College Writing I <u>3</u>	42.102	College Writing II <u>3</u>
	9		9

SECOND YEAR

*92.209	Introduction to Basic OR		
92.219	Basic Programming .....3	92.265	Introduction to Pascal .....3
90.131	Calculus I .....3	90.132	Calculus II .....3
99.131	Technical Physics I <u>3</u>	99.132	Technical Physics II <u>3</u>
	9		9

THIRD YEAR

90.231	Calculus III.....3	90.232	Calculus IV .....3
92.383	Introduction to Statistics .....3	42.225	Technical & Scientific Communications .....3
.....	Area II Elective <u>3</u>	.....	Human Values Elective..... <u>3</u>
	9		9

FOURTH YEAR

84.121	Chemistry I .....3	84.122	Chemistry II .....3
92.461	Systems Simulation & Modeling .....3	90.222	App. Linear Algebra II.....3
90.221	Applied Linear Algebra I..... <u>3</u>	.....	Areal I or II Elective..... <u>3</u>
	9		9

*92.209 is for students with NO prior programming experience; 92.219 is for students with prior programming experience.

Years 5-8 Leading to the Degree of Bachelor of Science

FIFTH YEAR

First Semester (Sept.)			Second Semester (Jan.)		
Subject No.		Credits	Subject No.		Credits
92.234	Differential Equations	3	90.315	Partial Differential Equations	3
92.321	Discrete Structures	3	.....	Area II Elective	3
*.....	Technical Elective	<u>3</u>	*.....	Technical Elective	<u>3</u>
		9			9

SIXTH YEAR

92.362	Numerical Analysis I	3	92.454	Numerical Analysis II.....	3
92.301	Intro to Applied Math. I	3	92.302	Intro Applied Math. II.....	3
**+...	Technical Elective	<u>3</u>	**+...	Technical Elective	<u>3</u>
		9			9

SEVENTH YEAR

+.....	Computer Elective	3	+.....	Computer Elective	3
.....	Mathematics Elective	3	.....	Mathematics Elective	3
.....	Technical Elective	<u>3</u>	.....	Technical Elective	<u>3</u>
		9			9

EIGHTH YEAR

+.....	Computer Elective	3	+.....	Computer Elective	3
92.411	Complex Variables I.....	3	.....	Mathematics Elective	3
.....	Technical Elective	<u>3</u>	.....	Technical Elective	<u>3</u>
		9			9

*Those holding an Associate of Science (Mathematics) must take 92.364 and 92.360. Those holding an Associate of Science (Computer) must take 90.221 and 90.222.

**Those holding an Associate of Science (Mathematics) must take 92.367 and 92.462. Those holding an Associate of Science (Computer) must take 84.121 and 84.122.

+The above courses may be replaced by a sequence of related courses approved by the Program Coordinator.

All other electives shall be chosen after conference with the Program Coordinator and MUST be approved by him.

III

Applied Mathematics (Computer Option)

Associate of Science & Bachelor of Science Programs

Suggested Course of Study

Years 1-4 Leading to the Degree of Associate of Science

FIRST YEAR

First Semester (Sept.)		Second Semester (Jan.)	
Subject No.	Credits	Subject No.	Credits
*92.209	Introduction to Basic OR		
92.219	Basic Programming .....3	92.263	Fortran Programming.....3
90.113	College Algebra .....3	92.115	College Trigonometry .....3
42.101	College Writing I .....3	42.102	College Writing II .....3
	<u>9</u>		<u>9</u>

SECOND YEAR

68.201	Economics I .....3	68.202	Economics II .....3
92.265	Pascal Programming .....3	90.132	Calculus II .....3
90.131	Calculus I .....3	92.364	Prob. Solving Pascal.....3
	<u>9</u>		<u>9</u>

THIRD YEAR

92.463	Systems Design & Dev. I .....3	92.464	Systems Design & Dev. II .....3
90.231	Calculus III.....3	90.232	Calculus IV .....3
92.383	Introduction to Statistics .....3	99.131	Technical Physics I .....3
	<u>9</u>		<u>9</u>

FOURTH YEAR

92.461	Systems Simulation & Modeling .....3	92.360	Data Structures .....3
99.132	Technical Physics II .....3	.....	Area I or II Elective .....3
92.321	Discrete Structures .....3	42.225	Technical & Scientific Communications .....3
	<u>9</u>		<u>9</u>

*92.209 is for students with NO prior programming experience; 92.219 is for students with prior programming experience.

Years 5-8 Leading to the Degree of Bachelor of Science

FIFTH YEAR

First Semester (Sept.)			Second Semester (Jan.)		
Subject No.		Credits	Subject No.		Credits
92.234	Differential Equations	3	92.455	Assembly Lan. Prog.	3
.....	Area I Elective	3	.....	Area II Elective	3
*.....	Technical Elective	<u>3</u>	*.....	Technical Elective	<u>3</u>
		9			9

SIXTH YEAR

92.362	Numerical Analysis I	3	92.454	Numerical Analysis II	3
92.301	Applied Mathematics I	3	92.302	Applied Mathematics II	3
**.....	Technical Elective	<u>3</u>	**.....	Technical Elective	<u>3</u>
		9			9

SEVENTH YEAR

.....	Computer Elective	3	.....	Computer Elective	3
92.462	Systems Program	3	.....	Mathematics Elective	3
.....	Technical Elective	<u>3</u>	.....	Human Values Elective	<u>3</u>
		9			9

EIGHTH YEAR

.....	Computer Elective	3	.....	Computer Elective	3
92.411	Complex Variable I	3	.....	Mathematics Elective	3
.....	Technical Elective	<u>3</u>	.....	Technical Elective	<u>3</u>
		9			9

*Those holding an Associate of Science (Mathematics) must take 92.364 and 92.360. Those holding an Associate of Science (Computer) must take 90.221 and 90.222.

**Those holding an Associate of Science (Mathematics) must take 92.367 and 92.462. Those holding an Associate of Science (Computer) must take 84.121 and 84.122.

All Technical electives shall be chosen after conference with the Program Coordinator and **MUST** be approved by him.

IV Information Systems

1. Associate of Science Degree

Associate of Science Degree Requirements - 72 Credits

Required Courses – Arts and Sciences	– 27 credits (as asterisked)
Required Courses – Business	– 18 credits (as asterisked)
Required Courses – Computer Science	– 21 credits (as asterisked)
Area II Elective	– 3 credits
Free Electives	– 3 credits

NOTE: Students transferring with an associate degree in accounting or banking may substitute these courses for the management courses listed above.

Suggested Course of Study

FIRST YEAR

First Semester (Sept.)		Second Semester (Jan.)	
Subject No.	Credits	Subject No.	Credits
*92.209	Introduction to Basic or	92.263	Fortran Programming.....3
92.219	Basic Programming .....3		
42.101	College Writing I .....3	90.119	College Algebra for Management II...3
90.112	College Algebra for Management I ...3	42.102	College Writing II3
	<u>9</u>		<u>9</u>

SECOND YEAR

67.201	Accounting Principles I .....3	67.202	Accounting Principles II.....3
42.224	Business Writing .....3	69.201	Principles of Management .....3
92.365	Cobol Programming I.....3	92.368	Cobol Programming II3
	<u>9</u>		<u>9</u>

THIRD YEAR

92.265	Pascal Programming .....3	92.364	Prob. Solving with Pascal .....3
67.311	Managerial Accounting.....3	69.331	Business Finance .....3
68.201	Economics I .....3	68.202	Economics II3
	<u>9</u>		<u>9</u>

FOURTH YEAR

90.241	Statistics for Business I.....3	90.242	Statistics for Business II .....3
.....	Area II Elective .....3	69.371	Operations Management I .....3
92.360	Data Structures .....3	.....	Elective .....3
	<u>9</u>		<u>9</u>

*92.209 Introduction to Basic is for students with no prior programming experience. 92.219 Basic Programming is for students with prior programming experience.

Note: 92.321 Discrete Structures is recommended for students planning graduate study.

2. Bachelor of Science Degree – 124 credits

Required Courses – Arts and Sciences

33 Credits (each subject – 3 credits)

- *42.101 College Writing I
- *42.102 College Writing II
- *42.224 Business Writing
- 47.101 General Psychology
- 48.101 Introduction to Sociology
- *90.112 College Algebra for Management I
- *90.119 College Algebra for Management II
- *68.201 Economics I
- *68.202 Economics II
- *90.241 Statistics for Business I
- *90.242 Statistics for Business II

Required Courses – Business

21 credits (each subject – 3 credits)

- *67.201 Accounting Principles I
- *67.202 Accounting Principles II
- *67.311 Managerial Accounting
- 69.321 Marketing Principles
- *69.331 Business Finance
- *69.371 Operations Management I
- *69.201 Principles of Management

Required Courses – Computer Sciences

36 credits (each subject – 3 credits)

- *92.209 Introduction to Basic OR
- 92.219 Basic Programming
- *92.263 Fortran Programming
- *92.265 Pascal Programming
- *92.360 Data Structures
- *92.364 Problem Solving with Pascal
- *92.365 Cobol Programming I
- 92.455 Assembly Language Programming I
- *92.368 Cobol Programming II
- 92.462 Systems Programming
- 92.474 Data Base Concepts
- 92.477 Management Information Systems I
- 92.478 Management Information Systems II

Required Electives – 34 credits

- Human Values Elective – 3 credits
- Area II Electives – 6 credits
- Science Elective – 4 credits
- Free Electives – 21 credits

(9 credits may be selected from accounting, banking, or management for a maximum of 30 credits in these subjects)

Mathematics

All mathematics courses, including those designated as Computer Science, except 90.010 and 90.111 are transferable to the University of Lowell day division upon appropriate University approval. Courses with the prefix 92 are equivalent to those in the day school with the same number. Day school students wishing to elect courses with the prefix 90 must consult the Chairperson and/or Coordinator in order to ascertain course equivalence.

90.010 Introductory Mathematics*

A transitional course designed for students with a limited mathematics background. The main purpose of this course is to give students an insight into the structure of basic mathematics including algebra, and to increase the student's manipulative skills in this area. One session per week, 3 credits.

90.111 Fundamentals of Algebra*

This course is intended for students with little or no background in basic algebra or whose background is not current. Topics covered include: the real number system, factoring, fractions, linear equations, functions, graphs, systems of equations and the quadratic equation. One session per week, 3 credits.

*Please note that 90.010, 90.111 are not usable as electives in any degree programs.

90.112 College Algebra for Management I

This course is intended for students whose background in basic algebra is current. The emphasis is on applications to the management and the social sciences. Topics covered include: an introduction to set notation, equations, inequalities, functions and matrices. Credit is not given for both 90.112 and 90.113. One session per week, 3 credits. Prerequisite: 90.111 or satisfactory score on the Math Placement Exam.

90.113 College Algebra

This course is intended for students whose background in basic algebra is current. The course objective is to provide students with the problem solving and computational techniques needed for further coursework and in their occupation. Topics covered include: quadratic equations, functions, transformations, inequalities, systems of equations and the exponential and logarithmic functions. Credit is not given for both 90.113 and 90.112. One session per week, 3 credits. Prerequisite: 90.111 or satisfactory score on the Math Placement Exam.

92.115 College Trigonometry

Angles and their measure, the trigonometric functions, solving triangles, law of sines, law of cosines, circular functions and their graphs, trigonometric identities. One session per week, 3 credits. Prerequisite: 90.113.

90.119 College Algebra for Management II

A continuation of 90.112. Topics covered include quadratic functions, the mathematics of finance, linear programming, optimization and an introduction to differential calculus. One session per week, 3 credits. Prerequisite: 90.112.

90.131 Calculus I

A first course in Calculus dealing with a brief review of Analytic geometry and trigonometry. The course progresses to the study of limits, derivatives, rules for differentiation of algebraic and transcendental function; chain rule, implicit differentiation, continuity, related rate problems, max. min problems, and curve sketching. One session per week, 3 credits. Prerequisite: 92.115.

90.132 Calculus II

A continuation of 90.131. The course covers integration, rectilinear motion, sigma notation, area, area between two curves, volumes by disc and shell methods, length of a plane curve and surface area, natural logarithm, the exponential function, hyperbolic functions, inverse functions and inverse trigonometric functions, integrals and derivatives of the inverse trig. functions, and integration formulas. One session per week, 3 credits. Prerequisite: 90.131.

90.221 Applied Linear Algebra I

An introduction to sets and mathematical logic. The basic properties of linear mappings, matrices, scalar products and orthogonality, systems of linear equations. Applications of the above. One session per week, 3 credits. Prerequisite: 90.231 or permission of coordinator.

90.222 Applied Linear Algebra II

Matrices and bilinear forms; symmetric, hermitian and unitary operators, eigenvectors and eigenvalues; the Caley Hamilton, Sylvester and Spectral Theorems. Applications of the above. One session per week, 3 credits. Prerequisite: 90.221.

90.231 Calculus III

A continuation of Calculus II. This course covers integration by parts, integration of trigonometric integrals, trigonometric substitution, partial fraction, numeric integration, improper integrals, L'Hopital's Rule, indeterminate forms, sequences, infinite series, integral test, comparison tests, alternating series tests, power series, Taylor series, polar coordinates, graphs and areas in polar coordinates, and parametric equations. One session per week, 3 credits. Prerequisite: 90.132.

90.232 Calculus IV

A continuation of Calculus III. This course covers vector calculus, curvature, cylindrical surfaces, dot and cross products, curves and planes in three space, cylindrical and spherical coordinates, functions of two variables, chain rule, directional derivatives and gradient, tangent planes and functions of n variables, a double and triple integrals in rectangular, polar, cylindrical and spherical coordinate systems. One session per week, 3 credits. Prerequisite: 90.231.

90.241 Statistics for Business I

Descriptive statistics, sophisticated counting techniques and other components of probability, simple random variables and their distributions, bivariate functions, sampling theory, properties of estimators, confidence intervals, and hypothesis testing. One session per week, 3 credits. Prerequisite: 90.112 or 90.113. May not also take 92.383.

90.242 Statistics for Business II

Analysis of variance, applied regression theory, correlation analysis, and other selected topics. One session per week, 3 credits. Prerequisite: 90.241. May not also take 92.383.

92.234 Differential Equations

A course in ordinary differential equations including equations of order one, linear differential equations, non-homogeneous equations, method of undetermined coefficients, the Laplace transform, systems of equations, electric circuits and network, existence and uniqueness of solutions, and nonlinear equations. One session per week, 3 credits. Prerequisite: 90.231.

92.301 Introduction to Applied Mathematics I

Matrices. Vector analysis, review of vector algebra, vector calculus, divergence theorem. Green's theorem and Stokes' theorem. One session per week, 3 credits. Prerequisite: 90.232.

92.302 Introduction to Applied Mathematics II

Series solutions of ordinary differential equations. Bessel functions, Legendre functions. Ordinary differential equations, boundary value problems, Fourier series and integrals. Partial differential equations of physics and engineering, separation of variables. One session per week, 3 credits. Prerequisite: 92.234.

92.305 Introduction to Real Analysis I

Some set theory including equivalence and countability. An axiomatic introduction to the real number system. Sequences of real numbers including boundedness, monotonicity, convergence, divergence. Series of real numbers including convergence, divergence, absolute convergence. Limits and continuity of real functions of a real variable. Metric spaces including open sets, closed sets, limits of sequences, limits and continuity of functions, connected sets, compact sets, bounded sets, totally bounded sets, completeness, continuous functions on compact sets, the Intermediate Value Theorem, uniform continuity. One session per week, 3 credits. Prerequisites: 90.221, 90.231.

92.306 Introduction to Real Analysis II

The calculus of Newton & Leibnitz including the Riemann integral, averages of a function, the derivative, the Fundamental Theorems of Calculus, the Mean Value Theorem. Sequences and series of real valued functions of a real variable including pointwise convergence, uniform convergence, integration and differentiation. The Weierstrass Approximation Theorem and the Stone-Weierstrass Theorem. Lebesgue measure including measurable sets, nonmeasurable sets, measurable functions. The Lebesgue integral including the The Lebesgue Dominated Convergence Theorem, Fatou's Lemma, and the metric space $L^1[a,b]$. One session per week, 3 credits. Prerequisite: 92.305.

92.307 Probability and Mathematical Statistics I

Probability functions and densities, expectations. Moments of probability distributions. Central Limit Theorem. One session per week, 3 credits. Prerequisite: 90.232.

92.308 Probability and Mathematical Statistics II

Sampling, decision theory, estimation, hypothesis testing, regression and correlation. One session per week, 3 credits. Prerequisite: 92.307.

90.315 Partial Differential Equations I

Basic concepts in partial differentiation. Classification and solution of first order and higher order linear partial differential equations. Introduction to Bessel, Legendre, and other orthogonal functions. Boundary value problems, including application of Fourier Series, Fourier Integrals, and Laplace Transforms. One session per week, 3 credits. Prerequisite: 92.234.

92.321 Discrete Structures I

Propositional logic, connectives, rules of inference, quantifiers. Proofs, proof by contradiction, induction, applications in computer logic and proofs of program correctness. Algebra of sets, relations on sets, equivalence relations, functions, composition, one-to-one, onto, orderings, applications to data structures and topological sorting. Matrices, solution sets for systems of matrix operations, eigenvalues and eigenvectors, diagonalization and Jordan canonical form. One session per week, 3 credits. Prerequisite: 90.112 or 90.113 or equivalent.

92.322 Discrete Structures II

Algebraic structures, sets with operations, associative, commutative, and distributive operations, modular arithmetic, electronic privacy and signature. Groups and semigroups, group axioms, permutation groups, cosets, normal subgroups, sequential machines. Directed and undirected graphs, paths, circuits, reachability and connectedness, decision trees, balanced trees, polish notation and trees, graph scheduling problems, flow in network, data structures. Lattices and Boolean Algebra, switching theory, logic design. Finite fields, representation and structure, minimal and irreducible polynomials, primitive elements, polynomial roots, error-correcting codes, public security key systems. One session per week, 3 credits. Prerequisite: 92.321.

92.362 Numerical Analysis I

Theory and applications of numerical techniques including: error analysis, non-linear systems of equations, matrices, eigenvalues, interpolation and collocation of polynomials, numerical integration. Computer solutions are emphasized. One session per week, 3 credits. Prerequisites: 92.263, 90.231.

92.381 Introduction to Operations Research Techniques I

The use of decision models in industrial systems. Fundamentals of probability and matrix theory. Critical path methods. Linear programming. The simplex method. Sensitivity analysis. Goal programming. Transportation and assignment models. Integer programming. One session per week, 3 credits. Prerequisite: 90.132.

92.382 Introduction to Operations Research Techniques II

A continuation of 92.381. Topics include: inventory control models, Markov analysis, queuing models, dynamic programming, network analysis, and simulation techniques. One session per week, 3 credits. Prerequisite: 92.381.

92.383 Introduction to Statistics

Sets and probability laws, random variables, mathematical expectations, measure of central tendency and variance. Study of discrete and continuous probability distribution, sampling theory, tests of hypothesis. Regression and correlation. (May not be used to satisfy mathematics major requirements. Primarily for students who want a one semester introduction to statistics. Students who wish a more detailed development of statistics and probability are advised to take the sequence 92.307, 92.308.) One session per week, 3 credits. May not also take 90.241, 90.242.

92.411 Complex Variables I

Complex numbers. Functions of a complex variable. Mappings. Derivatives. Analytic functions. Elementary functions. Integrals. Laurent series. Residues and poles. Contour integration. One session per week, 3 credits. Prerequisite: 90.232.

92.412 Complex Variables II

Transformations. Conformal mappings. Boundary conditions. Application in heat conduction, electrostatic potential, and fluid flow. Gamma and beta functions. Inverse Laplace transform. Riemann surfaces. One session per week, 3 credits. Prerequisite: 92.411.

92.421 Abstract Algebra I

Elementary group theory, groups, cosets, normal subgroups, quotient groups, isomorphisms, homomorphisms, series of groups, the Sylow theorems, free groups and homology groups. One session per week, 3 credits. Prerequisite: 90.132.

92.422 Abstract Algebra II

Elementary ring and field theory, quotient rings and ideals, homomorphisms of rings, rings of polynomials, algebraic extensions, automorphisms of fields, separable extensions. Galois Theory. Introduction to categories and functions. One session per week, 3 credits. Prerequisite: 92.421.

92.442 Boundary Value Problems

The Fourier series as a tool of analysis. Orthogonal functions, convergence tests, the Fourier integral, partial differential equations of physics and engineering, and boundary value problems. One session per week, 3 credits. Prerequisite: 90.315.

92.454 Numerical Analysis II

Continuation of 92.362 including: numerical solution of ordinary and partial differential equations, boundary value problems, curve-fitting, linear programming, error analysis and computer solutions. One session per week, 3 credits. Prerequisite: 92.362.

92.465 Formal Languages

This course will study the formal or abstract properties of (computer) languages and of acceptors/recognizers for valid expressions in the syntax of the languages. Topics to be covered will include: The Chomsky hierarchy of languages, Finite State Machines: their basic properties/results and as acceptors for Regular Expressions. Two-way Acceptors and Automata, Pushdown Automata: acceptors for Context Free Languages and grammars for Pushdown Automata. Context Free Grammars. Transformations on grammars and canonical forms for grammars. Syntax Anal-

ysis: Top-down, bottom-up and precedence analysis. Parsing. Turing Machines. One session per week, 3 credits. Prerequisite: 92.265 or 92.453.

92.466 Theory of Computation

Models of computation. Turing machines and Turing-computable functions. Other models of computation. The Church-Turing thesis. Universal machines. Recursive functions, primitive recursive and partial recursive functions. Simulation of various computations. Recursive and recursively enumerable sets. Unsolvable problems: Computable versus non-computable functions. Halting problem, equivalence problem, word problems, etc. Other topics as time and interest permit. One session per week, 3 credits. Prerequisite: 92.265 or 92.453.

92.471 Introduction to the Design and Analysis of Algorithms

Basic steps in developing an algorithm, correctness, algorithm design techniques such as hill climbing, subgoals, heuristics, backtracking, branch and bound, recursion, sorting and searching, paging, parallelism, algorithm and program correctness, measures of algorithm efficiency, complexity and overall effectiveness. One session per week, 3 credits. Prerequisite: permission of coordinator.

92.498 Mathematics Seminar

Student reading, writing, and criticism of topics from current literature. Review of some important elements of undergraduate work. One session per week, 3 credits. Prerequisite: permission of coordinator.

Computer

Students registering for programming courses will be required to spend non-class time at the University's Computer Center.

92.209 Introduction to Basic

An introduction to the processing of information by computer. Computer logic, memory, inputs and outputs, timesharing, flow-charting techniques, and programming in the Basic Language. This course is for students with no prior programming experience. One session per week, 3 credits. Prerequisite: 90.111 or equivalent. Credit given for only one of 92.209 and 92.219.

92.219 Basic Programming

Programming in Basic, including nested loops, subscripted variables, string manipulation, subroutines and advanced programming techniques. Prerequisite: 90.111 and working knowledge of some other programming language. One session per week, 3 credits. Credit given for only one of 92.209 and 92.219.

92.263 Fortran Programming

Programming principles of Fortran including input-output, arithmetic and control statements; arrays, functions and subroutines. Structures programming will be emphasized. Students will process several problems on the Cyber 71. One session per week, 3 credits. Prerequisites: 90.112 or 90.113.

92.265 Pascal Programming

An introduction to computer programming including the elements of algorithm design and data structures. The Pascal language will be used. Topics covered include: algorithm development by step-wise refinement, language control structures, functions and procedures, the standard data types, scalar data types, and an introduction to structured types. The student will process a number of programs on the University computer. One session per week, 3 credits. Prerequisite: 92.263.

92.267 "C" Programming

In this course, students are introduced to the techniques of programming in "C". The language syntax, semantics, its applications, and the portable library are covered. Prerequisite: 92.265.

92.360 Introduction to Data Structures

Basic concepts of data. Linear lists, strings, arrays and orthogonal lists. Trees and graphs. Storage systems and structures. Storage allocation and collection. Multilinked structures. Symbol tables, searching and sorting (ordering) techniques. One session per week, 3 credits. Prerequisites: 92.265, 92.321.

92.363 SPSS

This course will deal with the computer analysis of data, derived from research conducted primarily in the social, behavioral, and life sciences. The course will include such topics as: data presentation, organization and coding; SPSS system, developing SPSS input deck with various control and procedure cards, generating SPSS files; data modification, recoding and transformation of data; file manipulation, producing input/output files, deleting, retaining, adding variables, etc.; various statistical procedures, from descriptive statistics to more complex multi-variate statistics. Data sets including completed questionnaires, will be issued to students for practice in working with the SPSS system and for use in performing various functions, from encoding data to complete statistical analyses. One session per week, 3 credits. Prerequisite: knowledge of basic statistics.

92.364 Problem Solving with Pascal

This course is designed to be a practical problem solving course, to give students further exposure to the topics covered in 92.265, and to provide the tools needed for software development. The course emphasizes these aspects of the programming problem solving process: problem specification and organization, algorithms, coding, debugging, the elements of good programming style and the means of producing a high quality finished product. Programming examples are chosen to span a wide range of both numeric and non-numeric applications. One session per week, 3 credits. Prerequisite: 92.265.

92.365 Cobol Programming I

Programming principles of COBOL, the Common Business Oriented Language; identification, environment, data, and procedures divisions, introduction to compilation procedures and diagnostic processing. Programming of basic business applications such as inventory and accounting problems. One session per week, 3 credits. Prerequisite: 92.209.

92.366 Problem Solving with Fortran

Advanced Fortran programming techniques including multi-dimensional arrays, all Fortran data types, character data, file manipulations, and advanced subprogram techniques. An indepth treatment of such fundamental concepts as data storage, subprogram argument passing, and multi-dimensional array addressing. Additional topics include testing and debugging, numerical operating system, and implementation of algorithms. One session per week, 3 credits. Prerequisite: 92.263.

92.455 Assembly Language Programming I

Absolute machine language coding and the symbolic programming language; the coding of practice problems on a high-speed digital computer using the basic computer instructions including arithmetic, input-output, logic, control operations and data manipulation. One session per week, 3 credits. Prerequisite: 92.263 or 92.265.

92.368 Cobol Programming II

A continuation of 92.365. Advanced programming problems in COBOL, discussion of COBOL systems software, sophisticated routines and generalized business file manipulation. One session per week, 3 credits. Prerequisite: 92.365.

92.457 ADA

An introduction to the syntax and semantics of the programming language ADA, including data structures and types, control structures, tasks, packages and generics. Practical exercises involving the language will be included. One session per week, 3 credits. Prerequisite: 92.265.

92.461 Systems Simulation and Modeling

Procedures in model construction and computerized simulation, modeling tools and techniques, model conceptualization and implementation, selected applications of simulation. One session per week, 3 credits. Prerequisites: 92.263 or 92.265, 92.383.

92.462 Systems Programming

Basic concepts of assembly programs and compilers, macro-generators, utility programs, supervisions, monitors and high level languages. One session per week, 3 credits. Prerequisite: 92.265, 92.360.

92.463 Systems Design and Development I

A general study of the design and development of computer-oriented data processing systems including: the approach requirements of the system, developing the solution, data controls, system controls, system evaluation and reporting to management. One session per week, 3 credits. Prerequisite: 92.367.

92.464 System Design and Development II

A continuation of 92.463 including: finalizing and implementing the system, post-installation evaluation, and interdepartmental coordination, case studies. One session per week, 3 credits. Prerequisite: 92.463.

92.467 Assembly Language Programming II

A continuation of 92.367. Symbolic programming using advanced techniques including macro instructions, indirect addressing, file generation and processing, magnetic tape and magnetic disk applications. One session per week, 3 credits. Prerequisite: 92.367.

92.468 Microcomputer Principles and Applications

Current microcomputer practices covering both hardware and software including basic microcomputer instruction sets, operating systems, assembler and I/O programming, utilities, interrupts, and interfaces. Scientific, industrial and business applications throughout. One session per week, 3 credits. Prerequisites: 92.265.

92.469 Compiler Construction Techniques

Typical compiler organization is studied including symbol tables, various types of scans, object code generation, error diagnostics, and optimization techniques. Segments of a classroom compiler are written by students. One session per week, 3 credits. Prerequisites: 92.360, 92.367.

92.470 Data Communications

Analysis and use of remote computing systems including time-sharing remote batch and real-time systems. Design characteristics, applications, data communication, economics and management of such systems. One session per week, 3 credits. Prerequisites: 92.265, 92.360.

92.474 Data Base Concepts

An introduction to data base directives, design element of 3 data bases, architectures, and commercial data bases will be presented. Students will participate in design of a large scale data base application. Administration of the data base. Students will program the basic concepts on a machine. Prerequisites: 2 semesters of higher level language, excluding Basic. One session per week, 3 credits.

92.476 Computer Organization

This course will cover much of the computer architecture knowledge necessary for the software engineer. Students are introduced to the representation of information and to the concepts of gates and elementary logic. Storage mechanisms and memory organizations are described and a functional layout of an elementary computer is given. Addressing methods are explained and various methods of I/O are discussed. The course is filled out with discussions covering microprocessors, large computers, parallelism, and distributed logic. One session per week, 3 credits. Prerequisites: 92.265, 92.367.

92.477 Management Information Systems I

Analysis and evaluation of third generation integrated software systems including hardware for requirements, routine and demand reports, architectural evaluation for integrated business function control and the data base design. One session per week, 3 credits. Prerequisite: Junior Status.

92.478 Management Information Systems II

Automated decision-making models, systems user consideration, the economics of MIS, detailed case studies of large scale MIS including effects on management organization, personnel and data management. One session per week, 3 credits. Prerequisite: 92.477.

Science

94.341 Fundamentals of Science I

A study of the basic concepts of science. Topics to be covered include: the influence of the scientific method in understanding science, energy and motion. Newtonian physics, fluids and waves, kinetic theory of matter, and electricity. Methods of scientific calculations will be treated. One session per week, 3 credits.

94.342 Fundamentals of Science II

A continuation of the study of the basic concepts of science. Topics to be covered include: electricity and magnetism, light, meteorology, atoms and molecules, theory of the atom, the Periodic Law, crystals, ions and solutions, chemical reactions, acid-base theory, and basic organic chemistry. This may be taken before or after 94.341. One session per week, 3 credits.

Biology

81.111 Principles of Biology I

Introduction to biological systems above the unit organismal level. Study of plants and animals with respect to reproduction and development, behavior, genetics, evolution, ecology and biogeography. One session per week, 3 credits.

81.112 Principles of Biology II

An introduction to the structure and function of biological processes at the sub-cellular, cellular, and organismal levels. Discussions include metabolism, growth, differentiation, and physiology of plants and animals. One session per week, 3 credits.

83.101 Life Science I

An introduction to the study of Biology which considers first the chemical basis of life, and then the earth's environment as a community in which plants and animals live, interact, and demonstrate genetic variations which enable them to adapt to changes and evolve. One session per week, 3 credits.

83.103 Life Science Laboratory I

Laboratory work associated with 83.101. One session per week, 1 credit. Corequisite: 83.101.

82.161 Emergency Care — A First Responders Course

The objective is to provide training in all aspects of immediate emergency medical care required at the scene of an accident or illness. The scope of the course concerns itself with the roles and responsibilities a first responder has at the accident scene. These include medical-legal aspects of rendering emergency care, treating life threatening emergencies including airway care, CPR, control of bleeding and shock; treating accident related injuries including wounds, fractures and burns. Also discussed will be illnesses or conditions such as heart attack, stroke, diabetes, epilepsy, abuse of alcohol and drugs, and childbirth. The student will learn patient examination, diagnosis, and triage; how to gain access to patients using simple handtools; and how to move injured persons. The emphasis of the training is devoted to the practical aspects of emergency care rendered at the scene.

Under Mass. Gen. Law chapter III section 201, all police officers, firefighters and lifeguards not assigned to administrative duties are required to be trained to the first responder level minimally. This course fills both the need of present and future law enforcement officials. This course does not fulfill any portion of the University Area III elective. One session per week, 3 credits.

82.261 & 82.262 Emergency Medical Care I & II

This course provides the necessary knowledge and skill to give emergency medical care at the emergency scene. The curriculum covers the basics of understanding the emergency situation, as well as specialized emphasis in respiration and resuscitation, bleeding, wounds and shock, use and care of

emergency equipment commonly accepted and employed such as suction machines, oxygen delivery systems, backboards, fracture kits, obstetrical kits, stretchers of various types and light rescue tools. Also taught are management of mentally disturbed patients, and initial care of poison and burn patients along with environmental emergencies. Included in the course are lectures on anatomy and physiology by local physicians. Successful completion of the course entitles one to take the National Registry Exam for Emergency Medical Technician. This course does not fulfill any portion of the University Area III elective. One session per week, 3 credits.

Chemistry

84.111 General Chemistry I

A one semester survey of the principles of inorganic chemistry: the structure of matter, the quantitative aspects of chemical reactions, solution chemistry, including acid-base chemistry and ionic equilibria. One session per week, 3 credits. Corequisite: 84.113.

84.112 General Chemistry II

A survey of the basic principles of organic chemistry and biochemistry with emphasis on biochemical aspects of carbohydrates, lipids, proteins, and nucleic acids. Various metabolic pathways are also emphasized. Primarily for nursing majors. One session per week, 3 credits. Prerequisite: 84.111. Corequisite: 84.114.

84.113 General Chemistry Laboratory I

The laboratory course corequisite with 84.111 with experiments designed to cover the structure of matter, the quantitative aspects of chemical reactions, and solution chemistry, including acid-base chemistry and ionic equilibria. One session per week, 1 credit.

84.114 General Chemistry Laboratory II

Laboratory experiments designed to illustrate the principles discussed in 84.112. Prerequisite: 84.113 or permission of coordinator. One session per week, 1 credit.

84.121 Chemistry I

Class and demonstration. An introduction to the basic concepts of chemistry. Topics include chemical calculations, atomic structures, the periodic table, basic bonding theory, solutions, liquids, gases. One session per week, 3 credits.

84.122 Chemistry II

Class and demonstration. A continuation of 84.121. Topics include thermodynamics, kinetics, acids and bases, introduction to organic chemistry, chemical equilibrium, precipitation reactions, electrochemistry. One session per week, 3 credits. Prerequisite: 84.121.

84.223 Principles of Organic Chemistry I

Discussions of structure, classification by functionality, nomenclature, synthesis and reactions, mechanisms of reactions of organic compounds. One session per week, 3 credits. Prerequisite: 84.122. Corequisite: 84.225 or permission of coordinator.

84.224 Principles of Organic Chemistry II

A continuation of first semester subject 84.223. One session per week, 3 credits. Prerequisite: 84.223. Corequisite: 84.226 or permission of coordinator.

84.225 Principles of Organic Chemistry Laboratory I

Laboratory work in this course is scheduled to accompany topic presentations in the lecture phase of the course (84.223) and will be devoted to product separation and purification techniques, methods of synthesis of important compounds, and instrumental analytical techniques. One session per week, 1 credit. Corequisite: 84.223.

84.226 Principles of Organic Chemistry Laboratory II

A continuation of the first semester laboratory course, 84.225. One session per week, 1 credit. Prerequisite: 84.225. Corequisite: 84.224.

84.314 Analytical Chemistry II

This course will introduce the student to modern instrumental methods of chemical analysis. Included are such topics as ultraviolet, infrared, nuclear magnetic resonance, emission and atomic absorption spectroscopy. Mass spectrometry, thermal and electrochemical methods of analysis will be discussed. One session per week, 3 credits. Prerequisites: 86.122, 99.143. Corequisite: 84.316. Offered in spring 1980 and alternate years thereafter.

84.316 Analytical Chemistry II Laboratory

Laboratory experiments designed to compliment the coverage of topics in 84.314. One session per week, 1 credit. Prerequisite: 86.122. Corequisite: 84.314. Offered on alternate years.

84.334 Advanced Inorganic Chemistry

An introduction to modern theories of atomic structure and chemical bonding with emphasis on physical chemical principles and properties. Considerable time will be spent on coordination compounds including topics such as descriptive chemistry, biochemical importance, and ligand field theory. One session per week, 3 credits. Prerequisite: 84.345. Offered on alternate years only.

84.344 Physical Chemistry I

The 84.344-84.345 sequence covers basic physical chemical topics: laws of thermodynamics, solutions, chemical and phase equilibria, electrochemistry, kinetics, atomic and molecular structure. One session per week, 3 credits. Prerequisites: 86.122, 90.132, 99.143. Corequisite: 84.346.

84.345 Physical Chemistry II

See description under 84.344. One session per week, 3 credits. Prerequisite: 84.344. Corequisite: 84.347.

84.346 Physical Chemistry Laboratory I

Laboratory work designed to exemplify the principles covered in 84.344. One session per week, 1 credit. Corequisite: 84.344.

84.347 Physical Chemistry Laboratory II

Laboratory work designed to exemplify the principles of chemical kinetics, equilibrium and spectroscopy. One session per week, 1 credit. Corequisite: 84.345.

86.121 Analytical Chemistry I

Class and laboratory. The principles and calculations of gravimetric and volumetric analysis. One session per week, 3 credits. Prerequisites: 84.122, 92.115.

86.122 Analytical Chemistry II

Class and laboratory. Advances concepts in wet methods of analysis. One session per week, 3 credits. Prerequisite: 86.121.

86.352 Chemical Applications

A study of the chemical principles applied to one or more areas of industrial technology. One session per week, 3 credits. Prerequisite: 84.345. Offered in spring 1980 and alternate years thereafter.

86.361 Advanced Organic Chemistry

An in-depth coverage of properties and reactions of organic compounds stressing such aspects as synthetic methods and reaction mechanisms. One session per week, 3 credits. Prerequisites: 84.224, 84.345. Offered in fall 1980 and alternate years thereafter.

86.362 Advanced Organic Chemistry

A continuation of advanced level study of organic compounds stressing synthesis and reaction mechanisms. One session per week, 3 credits. Offered in spring 1981 and alternate years thereafter.

86.421 Special Topics In Chemistry

An in-depth treatment of one or more areas of advanced chemistry or industrial applications of chemistry. Students enrolling for the course must have the permission of the chemistry coordinator. One session per week, 3 credits.

86.471 Industrial Chemistry

Discussion of essential chemical principles in selected areas of industrial concern, including the effect of industrial processes on the environment. One session per week, 3 credits. Prerequisites: 84.224, 84.345. Offered in fall 1979 and alternate years thereafter.

86.481 Chemistry of High Polymers

The physical and organic chemistry of monomers

and polymers, including a consideration on non-bonding forces, spectroscopic methods of structure determination, fractionation and thermodynamics. One session per week, 3 credits. Prerequisites: 84.224, 84.345. Offered in fall 1980 and alternate years thereafter.

86.482 Chemistry of High Polymers

A continuation of 86.481. Topics presented will include methods of molecular weight determinations for polymers in solution, kinetics of condensation and addition polymerization, and mechanisms of free radical and ionic polymerization. One session per week, 3 credits. Offered in spring 1981 and alternate years thereafter.

Geology

89.101 General Geology I

A study of the earth with emphasis on earth materials, earth structure (crustal and internal), earth history and the development of life. Gives the general student an understanding of the dynamic earth and provides a foundation for advanced work. One session per week, 3 credits.

89.102 General Geology II

A continuation of 89.101, with emphasis on the surface of the earth and landform development. Includes special topics, introducing the student to recent geological research and applied geological knowledge. Designed for the general and continuing student. One session per week, 3 credits. Prerequisite: 89.101.

Physics

99.131 Technical Physics I

Class and laboratory. Kinematics and dynamics of particles and rigid bodies including vectors; motion in one and two dimensions; the laws of motion; gravitation; friction; work and energy; impulse and momentum; and rotation. One session per week, 3 credits. Two Friday night classes will be required. Corequisite: 92.115.

99.132 Technical Physics II

Class and laboratory. Elasticity, fluids, heat; thermodynamics; heat transfer; harmonic motion;

waves; reflection and refraction; lenses; interference; and diffraction. One session per week. Two Friday night classes will be required. 3 credits. Prerequisite: 99.131. Corequisite: 90.131.

99.133 Technical Physics III

Class and laboratory. Electric forces, fields, and potentials; magnetism; electromagnetic induction; physics of the atom; solid state electronics; physics of the nucleus. One session per week. Two Friday night classes will be required. 3 credits. Prerequisite: 99.132. Corequisite: 90.132.

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Cyril A. Pipan, (1985), Vice-President and Director of Marketing, Space Optics Research Labs,
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Catalogue Index

	Page		Page
Academic Standing		Course Descriptions	60
Grade-Point Requirements	18	Criminal Justice	60
Academic Probation	19	History	62
Probationary Readmission	19	Political Science	63
Day School Students	20	Psychology	64
Class Standing	21	Sociology	65
		Art	67
Accreditation and Professional		Composition	68
Membership	4	Literature	68
Additional Baccalaureate Degree	16	Languages	70
		Philosophy	71
Admission, General Requirement		College of Management Science	
Degree Program	13	Evening School Program Transfer	72
Calendar	108	Transfer to B.S. in B.A. Program	72
Career Development	6	Accounting	73
Counseling	6	Banking	74
Testing	6	Management	75
Resource Library	6	Course Descriptions	76
Career Planning and Placement	6	Accounting	76
		Banking	77
College of Engineering	24	Economics	79
College of Engineering Course Descriptions		Management	79
Civil Engineering Technology	36	College of Pure & Applied Science	
Electronic Engineering Technology	38	Program Descriptions	81
Mechanical Engineering Technology	42	Applied Chemistry	81
Industrial Technology	44	Applied Mathematics	83
Plastics	49	Applied Mathematics (Computer	
College of Engineering Programs		Option)	85
Civil Engineering Technology	24	Information Systems	87
Electronic Engineering Technology	26	Course Descriptions	89
Mechanical Engineering Technology	28	Mathematics	89
Industrial Technology	30	Computer	92
Manufacturing Option	30	Science	95
Water & Industrial Waste Option	32	Biology	95
Plastics Option	34	Chemistry	96
College of Health Professions		Geology	98
Matriculation and Retention	51	Physics	98
Nursing, Recommended Course of Study	52	Continuing Education Directory	99
Course Description		Continuing Education Description	3
Clinical Laboratory Science	54	Course Equivalency Procedure	23
Nursing	55	Day School Classes	10
College of Liberal Arts		Directions to the University	7
Public Service (Criminal Justice)	56	Evening Division Description	3
Bachelor of Liberal Arts (Social Science)	59		





	Page
Facilities	3
General Policies	8
Policy Changes	8
Special Students	8
Attendance	8
Audit	8
Federal Benefits	8
Student Responsibilities	8
Administrative Dismissal	8
Non-Academic Dismissal	8
Academic Expulsion	9
Class Schedule	9
Size of Class	9
Books & Supplies	9
Grading Information	17
Grading System	17
Withdrawal	17
Incomplete	17
Repeated Course Work	18
Remedial Courses	18
Graduation Information	21
Graduation Interview	21
Commencement Fee	21
University Honors	21
Commencement	21
Conferring of Degree	22
Alumni Association	22
History and Aims	3
Library	5
Regulations	5
Fines	5
Circulation Regulations	5
Map of the University	7
Off Campus Study	11
Program Planning	10
Registration	
Early Registration	10
Walk-In Registration	10
Late Registration	10

	Page
Senior Lecturers of Continuing Education ...	100
Summer Program	10
Transfer Credit	10
Tuition and Fee Information	12
Tuition/Academic Service Fee	12
Registration and Insurance Fee	12
Late Registration Fee	12
Tuition Refund	12
College Fees	12
Payment of Bill	12
University Requirements	
Associate Studies	13
Baccalaureate Studies	14
Core Requirements/including	
Area Requirements	14
Residency Requirements	13




CALENDAR

1986 - 1987

FALL TERM

	Mon.	Tue.	Wed.	Thur.	Fri.
Aug.	25	26	27	28	
	— Registration —				
Sept.		2	3	4	
	8	9	10	11	
	15	16	17	18	
	22	23	24	25	
Oct.	29	30	1	2	
	6	7	8	9	
		14	15	16	17 Mon. Class
	20	21	22	23	
	Last Week to Withdraw				
Nov.	27	28	29	30	
	3	4	5	6	Make Up
	10		12	13	Tues. Class
	17	18	19	20	Make Up
Dec.	24	25 Thur. Class	26		
	1	2	3	4	5 Make Up
	8	9	10 Exam	11 Exam	
	15 Exam	16 Exam			

SPRING TERM

	Mon.	Tue.	Wed.	Thur.	Fri.
Jan.	5	6	7	8	
	— Registration —				
	12	13	14	15	
		20	21	22	23 Mon. Class
Feb.	26	27	28	29	
	2	3	4	5	
	9	10	11	12	
		17	18	19	20 Mon. Class
Mar.	23	24	25	26	
	2	3	4	5	
	Last Week to Withdraw				
	9	10	11	12	
Apr.	16	17	18	19	
	23	24	25	26	27 Make Up
	30	31	1	2	3 Make Up
Apr.	6	7	8	9	10 Make Up
	13	14	15	16	
		21	22	23	
	27 Exam	28	29	30	
	Exams				

**University of Lowell
Continuing Education
Curnnock Hall
Lowell, MA 01854**

Third Class Mail

**'86-
'87**

UNIVERSITY OF LOWELL CONTINUING EDUCATION

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